STATE OF NEW HAMPSHIRE

REPORTS, 1897-1898

VOLUME II.—BIENNIAL

MANCHESTER, N. H.
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NEW HAMPSHIRE AGRICULTURE

REPORT

OF THE

BOARD OF AGRICULTURE

FROM

NOVEMBER 1, 1896, TO OCTOBER 1, 1898

By N. J. BACHELDER, Secretary

MANCHESTER, N. H.
Arthur E. Clarke, Public Printer
1898

BOARD OF AGRICULTURE.

Organized August 23, 1870.

MEMBERS.

His Excellency George A. Ramsdell.

Joseph B. Walker, *President*	Concord.
John D. Lyman, *Vice-President*	Exeter.
Willard Bill, Jr.	Westmoreland.
George H. Wadleigh	Tilton.
Laurin J. Miner	Whitefield.
William H. Sisson	Cornish.
E. E. Bishop	Bethlehem.
Herbert O. Hadley	Temple.
Charles B. Hoyt	Sandwich.
Joseph D. Roberts	Rollinsford.

N. J. Bachelder, *Secretary.*

GENERAL REPORT.

STATE OF NEW HAMPSHIRE.

BOARD OF AGRICULTURE,

CONCORD, October 1, 1898.

To His Excellency the Governor and the Honorable Council:

The report of the State Board of Agriculture from November 1, 1896, to October 1, 1898, is herewith submitted. The duties of the Board of Agriculture, as prescribed by law, may be classified under the following general divisions:

AGRICULTURAL SOCIETIES.

The Public Statutes impose upon the Board of Agriculture the duty of encouraging the formation of farmers' clubs, agricultural and horticultural societies, and kindred institutions. Under this provision the board has exercised all possible encouragement to the formation and success of dairy, horticultural, poultry, wool, and market garden associations, and has also manifested a deep interest in the advancement of the grange. No expense has been incurred by the board on account of any of these organizations, but the secretary has been allowed to devote considerable time in their interest. The Granite State Dairymen's Association has had a prosperous career, and the New Hampshire Horticultural Society has been active, although without a state appropriation. It is a matter of congratulation to the New Hampshire farmers that the number of subordinate granges has increased from 219 to 240, and the membership from 18,000 to over 20,000 since our last report. About the usual number of agricultural fairs have been held with the usual degree of success. The published report will contain information in detail in regard to

these agricultural societies, which are in every way commendable and entitled to liberal consideration.

FERTILIZER INSPECTION.

The supervision of the sale of commercial fertilizers in the state is by law placed under the State Board of Agriculture and experiment station, no commercial fertilizers being allowed to be sold without a license from this board. An agent of the board was sent through the state in May of each year, with instruction to stop at not less than two towns in each county and collect samples of all fertilizers found in the market. The result of this inspection in 1897 was 258 samples divided between 112 distinct brands of mixed fertilizers, representing twenty-five manufacturers. These were submitted to the College of Agriculture and Mechanic Arts at Durham for anaylsis, and the result published and distributed.

The inspection of 1898 resulted in obtaining a slightly less number of samples, which have also been forwarded to the college for analysis. This will also be published, and the result of both years' inspection will be published in full in the report. This fertilizer inspection is one of the most important duties of the board, and its details are attended to with particular care. Through this inspection in this and other states the purchase of licensed commercial fertilizers is now attended by no more uncertainty than the purchase of other articles of trade.

FARMERS' INSTITUTES.

The board has held thirty-eight farmers' institutes in as many different towns since our previous report, and appointed several others that had to be abandoned on account of severe storms. The subjects discussed have been such as were of special interest in the locality visited, and the attendance has been larger than in any previous period, averaging about two hundred for the thirty-eight institutes held. The one-day system of previous years has been continued, and seems to be better adapted than any other to New Hampshire condi-

tions. The demand for this form of agricultural instruction is annually increasing, and a broad field of usefulness is open for progressive institute work. In addition to the institutes held the secretary and members of the board have attended a large number of farmers' meetings of various kinds in the prosecution of the work of the board. Applications for sixty institutes are now on file, to be granted as soon as circumstances will allow. A detailed report of the institutes held is published in the report, which will indicate something of the deep interest taken by the farmers of the state in this work.

The following assignments of institutes have already been made:

1898.

Colebrook	October 13
Lancaster	October 14
Littleton	October 17
Plymouth	October 18
Tuftonborough	December 27
Sanbornville	December 28
Claremont	December 29
Plainfield	December 30

1899.

Dunbarton	January 6
Webster	January 7
Amherst	January 12
Mason	January 13
Westmoreland	January 19
Winchester	January 20
Barnstead	January 26
Alton	January 27
Atkinson	February 2
Rye	February 3
North Conway	February 9
Tamworth	February 10

Newport	February 17
Grantham	February 18
New London	February 24
Newbury	February 25
Hillsborough	March 4
Brookline	March 5
Gilsum	March 11
Fitzwilliam	March 12
Rollinsford	March 18
Strafford	March 19
Sandown	March 25
Newington	March 26

CONTAGIOUS DISEASES OF ANIMALS.

The Public Statutes place the authority in cases of contagious diseases among animals under the direction of the executive officer of the State Board of Health, State Board of Agriculture, and State Grange, with an annual appropriation not exceeding $10,000 for this purpose. The execution of the law has caused no additional salary to either of the above named officers, such veterinary services as were needed having been secured through the employment of the most skillful veterinarians in the state. The practice of former years of ordering a physical examination by a qualified veterinarian in all herds where the symptoms of a contagious disease were reported has been continued. The law allows the payment of one half the health value of all cattle condemned and destroyed as an inducement for reporting the disease rather than on account of any such value in the animals. Under this policy, during 1897, 288 stables were inspected; 234 tuberculous cattle and 14 glandered horses were condemned and destroyed. During 1898, 213 stables were inspected; 148 tuberculous cattle and 20 glandered horses were destroyed. We have on file in the office the recent statement of the selectmen of thirty-four towns, where the greatest number of tuberculous animals have been found, in regard to the prevalence of the disease as compared with previous years, and all, with

two exceptions, express the opinion that it is very materially reduced, and several that it has been eradicated. The regulations in regard to the admission of animals to the state have been enforced. These require a certificate of a qualified veterinarian, based upon the tuberculin test, if the animals are brought in to be sold, and upon a physical examination if the cattle are to be kept in the herd or upon the premises of the owner or manager of the cattle. We have also conducted an experiment with a herd of cattle reacting to the tuberculin test but manifesting no physical symptoms of the disease, that is of interest and value. The entire expense of dealing with contagious diseases among animals, including payment for cattle destroyed, since authorized by the legislature, has been but slightly more than one half the appropriation. A report in detail will be published in the Report.

ABANDONED FARMS.

The legislature of 1889 authorized the Board of Agriculture to collect information in regard to the natural advantages and resources of New Hampshire, and publish and distribute the same for the purpose of attracting people to invest money and locate in the rural sections of the state. A careful canvass of the state was made and 1,342 abandoned farms with tenantable buildings, or such as could be made so at little expense, were reported by the selectmen. Printed material setting forth the advantages of the rural sections of the state was prepared and widely circulated. Since our previous report, an edition of two thousand copies of the "Gems of the Granite State," including a complete list of the summer hotels and boarding-houses, has been issued. We have also just prepared the copy for a new list of the abandoned farms that will be ready for distribution soon. A large number of inquiries in regard to these abandoned farms have been received, amounting to 2,257 in a single year, coming from thirty-four states and two foreign countries. A canvass made in April of the present year shows the number of such places reduced more than 50 per cent, which is more than we expected to ac-

complish at the outset. We have replied to every letter of inquiry, and distributed over thirty thousand pamphlets of various kinds in this work. A detailed statement of this department of the work of the board will be published in the report.

PUBLIC MEETINGS.

Four public meetings have been held in addition to the institute work: One at Wolfeborough, in connection with the Granite State Dairymen's Association, in December, 1896, also one at Rochester under the same auspices in December, 1897. A field meeting was held at Hampton Beach in August, 1897, in co-operation with East Rockingham Pomona Grange, and a Good Roads Institute at Keene in May, 1898, the latter accompanied by an exhibition of road-working machinery in operation. The principal addresses delivered on these occasions will be found in the report.

AGRICULTURAL STATISTICS.

The law authorizes the Board of Agriculture to collect, through the selectmen, such statistics in regard to the result of agricultural investment and labor as are deemed of interest and value, but as the law fails to provide a penalty for neglect of the selectmen to exercise reasonable care and judgment in the matter it is rather ineffective. In March, 1898, an effort was made to collect statistics in regard to the dairy, sheep, and summer-boarding industry. Returns were received from the selectmen of 189 towns, giving as a whole fairly intelligent replies to our inquiries. These will probably be as correct as the result of investigation made by the state or federal government upon similar matters, for all are more or less the result of intelligent estimates. The returns received will be published in the report and will indicate something of the agricultural resources and productions of the towns reported. In order to obtain more complete returns a more drastic law upon the subject will be needed.

IMITATION BUTTER.

Under the provisions of the Public Statutes requiring the Board of Agriculture to promote all means and instrumentalities that will develop the agricultural resources of the state, some attention has been given to the enforcement of the oleomargarine law of the state. This law requires all hotels and boarding houses where imitation butter, colored to resemble pure butter, is used to notify their guests of the fact. It also forbids the sale of oleomargarine colored in imitation of butter. Several prosecutions were made under this law, and four parties convicted who paid their fines. This law can be enforced to the letter if proper attention is given to the matter, and such enforcements would seem to be in the interest of both the producer and would-be consumer of honest dairy products. The board is of the opinion that such enforcement would be legitimate work and such attention will be given in the future to this important matter as the legislature may require, and the funds appropriated will allow.

FINANCIAL.

The members of the Board of Agriculture receive no compensation for services, but are paid actual expenses. The salary of the secretary and expense of printing are fixed by law, over which the board has no jurisdiction. The expenses of the department have been as follows:

1897.

Expenses of members of the board and secretary	$558.06
Services and expenses of other lecturers at institutes and meetings	311.17
Miscellaneous expenses of institutes and meetings	303.24
Fertilizer inspection	150.29
Fertilizer analyses	627.00
Expense enforcing oleo law	82.10

Postage, express, telegrams, telephone, and stationery, for year ending June 30	$211.39
Office supplies, reference books, and incidentals	59.31
	$2,302.56

Cr.

By license fees for sale of fertilizers, year ending June 30	1,100.00
Net expenses of office, except printing and salary of secretary	$1,202.56

1898.

Expenses of members of the board and secretary	$484.65
Services and expenses of other lecturers at institutes and meetings	350.11
Miscellaneous expenses of institutes and meetings	356.91
Fertilizer inspections	138.53
Fertilizer analyses	320.00
Expenses on account enforcing oleo law	15.60
Postage, express, telegrams, telephone, and stationery, for year ending June 30	265.07
Office supplies, reference books, and incidentals	53.50
	$1,984.27

Cr.

By fines in oleo prosecutions	$50.00
By license fees for sale of fertilizers, year ending June 30	1,150.00
	$1,200.00
Net expense of office, except printing and salary of secretary	$784.27

IMMIGRATION ACCOUNT.

1897.

Expenses except printing	$506.10

1898.

Expenses except printing	$503.60

IN GENERAL.

In addition to these matters, which are regarded as the leading objects of the Board of Agriculture, much of a less important nature has been given attention. A very extensive correspondence has been conducted with persons in all parts of the country in regard to the agricultural products of New Hampshire, and the names of leading producers have been furnished to many parties in search of such goods as are produced upon the farms of our state. To a certain extent the Board of Agriculture has acted as a bureau of information upon all matters pertaining to the welfare of the farmers of the state and the advancement of their varied agricultural interests. Although the agricultural resources of New Hampshire are not as extensive as in some other states, they are susceptible of very material advancement in various ways, and this object will command the very earnest attention of the board in the future, in addition to the specific duties imposed upon the board by the Public Statutes in the various directions herein named. When intelligent and progressive methods are employed, and good judgment exercised in the selection of a crop adapted to New Hampshire conditions and markets, no section of the country can show greater net profit per acre. The dissemination of information bearing upon these matters will have the earnest attention of the Board of Agriculture in the future, to the end that New Hampshire may become more of an agricultural state, and more desirable for establishing homes for people from all sections of the country.

N. J. BACHELDER,
Secretary.

INSTITUTES.

Farmers' institutes, under the auspices of the board, in the series of 1896-7, in addition to those mentioned in our last report, were held at Goffstown, town hall, November 5, 1896; Barnstead, town hall, November 6; Windham, town hall, December 1; Bedford, town hall, December 2; Hampstead, town hall, December 3; Atkinson, Academy hall, December 4; Hollis, Grange hall, December 21; Mason, town hall, December 22; East Jaffrey, Mower's hall, December 23; Francestown, town hall, December 24; Swanzey, town hall, December 29; Westmoreland, town hall, December 30; Winchester, town hall, December 31; Fitzwilliam, town hall, January 1, 1897.

The subjects presented during these meetings of the series included "Substitutes for the Hay Crop," "Good Roads," and "Highway Improvement," by Dr. Towle; "Farm Essentials," by Mr. Bill; "Fertilizers," by Prof. F. W. Morse, of Durham; "Forestry" and "Culture of the White Pine," by Mr. Lyman; "Drainage" and "Hay Production," by Hon. Joseph B. Walker of Concord; "Milk Production" and "Sources of Fertility," by Prof. J. W. Sanborn of Gilmanton, and "Farm Sanitation" and "Prevention of Bovine Tuberculosis," by the secretary. Perley Fox of Marlow, master of Cheshire County Pomona Grange, was present at the meetings in Jaffrey, Francestown, and Westmoreland, and spoke upon the "Importance of Little Things," while the venerable president of the board, Hon. Moses Humphrey of Concord, attended the Goffstown meeting and discussed the general subject of "Agricultural Progress."

As a rule four speakers were in attendance at each institute. Afternoon and evening sessions were held in all cases, and in many instances a morning session was also held. The attendance was generally quite large, in some cases reaching several hundred. The immediate arrangements were in

charge of the subordinate granges in the various localities, thus increasing the interest, while the ladies of the grange served refreshments at the dinner and supper hour to all present from a distance. The presentation of the various subjects was generally followed by a brief discussion, participated in by members of the audience, and bringing out interesting points and suggestions; while music and recitation, also furnished by the grange, enlivened the exercises at the different sessions.

SERIES OF 1897-98.

The legislature not being in session, the institutes for 1897-98 were holden later in the season than the previous series. The arrangements were made through the subordinate granges in the localities chosen, the meetings, indeed, being generally appointed in response to invitations received from the granges, and their co-operation, as during the last series, contributing in large measure to the success manifested in both attendance and interest.

The opening institute of the series was held in the Grange hall, at Whitefield, Tuesday, December 28, and included three sessions. There was a good attendance in the forenoon, while the afternoon and evening audiences filled the hall to its utmost capacity. Hon. M. H. Bowker delivered an appropriate address of welcome, to which the secretary responded in behalf of the board. The principal address of the forenoon was by Herbert O. Hadley of Temple, the newly appointed member of the board for Hillsborough county, who discussed the subject of "Home Grown Feeds for Dairy Cattle," in a practical and interesting manner. In the afternoon, Superintendent C. H. Waterhouse, of the State Dairy School at Durham, discussed the "Care and Handling of Milk," and Professor Sanborn spoke upon "Sources of Fertility." At the evening session, Mr. Miner of Whitefield, the Coos county member, presided, and the speakers were President Walker, who gave an address upon "Holland," referring to its geographical peculiarities, its agriculture, and the manners and customs of its people, and Mr. Lyman, of Exeter, upon the

culture of the white pine. Music for the morning session was furnished by a grange choir, and in the afternoon and evening by the Oberon Quartet of Laconia. Mrs. Flora J. Miles of Carroll also gave an interesting recitation at the evening session. It may be stated, in short, that appropriate music and one or more recitations were furnished by the grange, for the enlivenment of the exercises, in each town where meetings were held, and abundant refreshment was also served by the ladies of the grange for those in attendance, which, with the social hour between sessions, added largely to the interest of the occasion in each instance.

The following day, December 29, three sessions were held in the town hall at Milan, where, notwithstanding the thermometer registered sixteen degrees below zero in the morning, a very good audience assembled. The subject of "Home Grown Feeds," was presented in the morning as at Whitefield. In the afternoon the "Care and Handling of Milk" and the "Judicious Feeding of Dairy Cows" were discussed, while the evening topics were "Forestry" and "Advice to the Boys and Girls"—the latter presented by Mr. Miner.

The third meeting of the series, in the old town hall, at Sugar Hill, Lisbon, December 30, was specially successful, in that it brought together the largest audiences ever convened in the place upon an occasion of this kind, the granges, both here and at Franconia, having made a special effort to create an interest. The feeding of dairy cows was discussed in the morning, and the "Sources of Fertility" and "Home Grown Feeds" in the afternoon, while Messrs. Miner, Waterhouse, and Lyman occupied the evening in the presentation of the subjects discussed by them at the previous sessions. Mr. Edward E. Bishop, who had just received his appointment as a member of the board for Grafton county, who was present, was introduced, and spoke briefly at the evening session.

At Orfordville, December 31, although the weather conditions were disagreeable, a heavy storm prevailing in the evening, two sessions were held, Messrs. Hadley, Miner, and Sanborn addressing a fair audience in the afternoon, and Messrs.

Lyman and Waterhouse speaking to a goodly number in the evening.

The next four meetings of the series were held at Cornish Flat and North Charlestown, in Sullivan county, and Walpole and West Chesterfield, in Cheshire, on Tuesday, Wednesday, Thursday, and Friday, January 26, 27, 28, and 29, respectively. Three sessions were held at each place, except at North Charlestown, where an early attendance had been prevented by the heavy snow storm of the previous night.

At Cornish the vestry of the Baptist church was used as the place of meeting. The subjects discussed were "Maple Sugar Production," presented by Charles B. Hoyt of Sandwich, the new member of the board for Carroll county; "Buying a Fertilizer," by Prof. F. W. Morse of Durham; "Business Methods in Farming," by Mr. Bill of Westmoreland, and "The Proper Management of the Dairy Herd," by the secretary. There was a good attendance, a strong interest, and quite a lively discussion following the presentation of the different subjects.

At North Charlestown the sessions were held in Union hall, the afternoon speakers being Mr. Hoyt and Professor Morse, upon the same subjects as at Cornish; while in the evening, Mr. Sisson of Cornish, the Sullivan county member, gave a practical talk upon "Creamery Management," and Mr. Bill gave his address on "Business Methods."

At Walpole, which is one of the most prosperous agricultural towns in the state, a good attendance was naturally looked for, and the most sanguine expectations in this respect were fully realized. The sessions were held in the Grange hall in the morning, and in the town hall, above, in the afternoon and evening, several hundred people being present at the latter. "Maple Sugar Production" was presented by Mr. Hoyt at the morning session, a spirited discussion following. "Buying a Fertilizer" and "Business Methods" were the afternoon subjects, and in the evening Secretary George H. Moses, of the State Forestry commission, gave an address upon "Forestry," advocating the purchase and care of mountain forest

lands by the state, and President Walker talked interestingly upon the subject of "Rice Culture in the South."

At West Chesterfield the meeting was in Citizens' hall, "Maple Sugar Production" being discussed in the morning, "Fertilizers" and "Business Methods" in the afternoon, and "Forestry" in the evening, President Walker supplementing the address of Mr. Moses at the latter session with some suggestions upon practical farm forestry.

On Wednesday, Thursday, and Friday, February 9, 10, and 11, institute sessions were held at Gilford, Hill, and Pittsfield, respectively, two sessions, afternoon and evening, being held in each place.

The town hall at Gilford was occupied for the meeting. Prof. F. W. Rane of Durham was the afternoon speaker, discussing "Horticulture on the Farm," and laying special stress upon the importance of some branch of horticulture to every farmer, as a secondary interest. In the evening Samuel Cushman, of Pawtucket, R. I., discussed the "Profits of the Poultry Yard," and the "Sanitary Care of the Dairy Herd" was presented by the secretary.

The meeting at Hill was held in the Grange hall. The subjects and leading speakers were the same as at Gilford, with the addition of ex-President Humphrey in the evening, who gave interesting reminiscences of his connection with the Board of Agriculture and some account of the past work of the organization.

At Pittsfield the elegant hall of the Knights of Pythias was occupied for the sessions, which were largely attended, both afternoon and evening. Professor Rane and Mr. Cushman were the speakers of the afternoon, presenting the subjects previously considered. In the evening ex-President Humphrey spoke briefly, and was followed by Channing Folsom of Dover in a strong address upon the "Rural School Problem," which is printed in full elsewhere in this volume. President Walker closed the speaking with a short address upon "Neglected Resources," dwelling particularly upon the improvement of swamp lands and the proper care of forests.

Institutes for the third week in February were arranged, to be holden at Litchfield, on Tuesday, 15th, and at Temple on the following day. Although the weather was unpropitious, and a storm was threatened, the Litchfield meeting was held as advertised, afternoon and evening sessions occurring in the town hall, with a good attendance considering the conditions. Mr. Hadley of Temple was the first speaker, discussing the subject of "Forage for Dairy Cattle." He was followed by President Walker on "Forestry." The presentation of each subject commanded close attention and elicited inquiry. In the evening Mr. Bill of Westmoreland presented "Business Methods in Farming," Prof. C. H. Pettee of Durham discussed "Highway Improvement," and the secretary spoke briefly on "Farm Sanitation."

The severe storm of the night and the morning following rendering the meeting at Temple impossible for that date, a postponement was made until Thursday, March 10, on which date afternoon and evening sesisons were holden there in the town hall, the secretary speaking upon the "Sanitary Requirements of Dairy Stables," and Mr. Bill upon "Economical Farm Methods" in the afternoon, and Professors Morse and Sanborn upon "Fertilizers" and "Feeding for Milk" in the evening.

In addition to these, several institutes were appointed that, owing to unfavorable weather, were postponed until the following season, and have been arranged for in the list announced. Through the influence and interest of the grange the institute work in the state is apparently on a better basis, and is productive of better results than at any previous time, and has every indication of being still more efficient and valuable in the future.

ANNUAL FIELD MEETING.

The annual field meeting was held at Hampton Beach, August 10, and was called to order by Hon. John D. Lyman, of Exeter, vice-president.

CHAIRMAN LYMAN'S ADDRESS.

Ladies and Gentlemen:

I am like the poor—*me* "ye have always with you," and you have come here today to listen, not to me, but to those from a distance, to our brothers who live yonder, even way across the Mississippi, or in that vicinity. I would like to talk for an hour or two, but will take some other occasion. I would like to speak of that iceberg season when Boar's Head was left here as a debris. I would like to tell our friend Jones of our prairie of the sea; I would like to point to a future time when these eighteen hundred acres of meadow land belonging to this good old town of Hampton should have the sea excluded from them and each bear two tons of the best English hay a year; I would like to speak of a time when the New Hampshire forests (with the expectation that they would soon be exhausted) should produce four or five times their present amount, and be as lasting as the sunshine and the waves of the ocean; of the time when the number of cows in our old Granite State should be doubled, and the quantity of good rich milk given by each should be greatly increased; of the time when instead of an average of ninety bushels of potatoes we should raise eight or nine hundred bushels to the acre; of the time when the steam engine shall be superseded by electricity and by the horseless carriages so numerous in

our cities, but time will not permit me. I have to introduce specimens of the apple by which our good old grandmother seduced her husband,—identical specimens of those which grew in the Garden of Eden.

My friends, this is a world of progress, and since we last met our nation has been rising in the estimation of the whole world, and, we believe, of God Almighty also.

It gives me pleasure to introduce to you our eloquent friend from New York and New Hampshire,—from New York, where he spends his winters as professor in that famous old university of Columbia, and who comes into New Hampshire to spend his summers amid the scenery whose grandeur is unsurpassed. I have the pleasure of introducing to you Prof. John D. Quackenbos of Columbia University, New York.

MEDICAL AND SURGICAL EMERGENCIES OF THE FARMER'S EVERY-DAY LIFE.

BY PROF. JOHN D. QUACKENBOS, NEW YORK.

Mr. President, Ladies and Gentlemen:

I have been allotted forty minutes by your honorable secretary to speak to you upon a subject second in importance to none that could have been selected, viz.: Medical and Surgical Emergencies in the Farmer's Every-day Life, or What shall we do until the Doctor comes? In view of the shortness of my time allowance, I shall forego the formality of an introduction, and ask your attention at once to the discussion.

We all know how long the country doctor sometimes *is* in coming. His office is five to ten miles away, and when summoned he is likely to be engaged at a still more distant point. The experiences of last winter demonstrate the efficacy of drifted and melting snow as a barrier between suffering and relief. For days at a time, in some sections, communication with a doctor was impossible except by snowshoe experts. No word of apology, therefore, is necessary to the medical pro-

fession for this attempt to instruct our people in the essential principles of those forms of immediate treatment that are indispensable in certain accidents and pathological conditions to the preservation of life.

First in importance among emergencies, as well on account of its frequency as of the danger that accompanies it, is the occurrence of hemorrhage or bleeding. All wounds bleed, but the amount of blood lost varies according to the size of the wounded vessel, and the peculiar constitution or state of health of the subject. In slight injuries, hemorrhage is spontaneously arrested, but with persons of hemorrhagic diathesis, or constitutional bleeders, a dangerous flow may result from a trifling laceration, like that involved in the extraction of a tooth or the excision of a tonsil. As a rule, however, the larger the severed vessel the greater the menace to life. There is no other crisis that requires so much coolness and presence of mind in would-be help-fellows as the management of an alarming outpour of blood, accompanied with shock or great vital depression,—pallid face, blue lips and finger nails, feeble pulse, falling temperature, sighing respiration, inaudible voice, dim vision, and general muscular powerlessness. If the blood that saturates the clothing is bright scarlet and spurts out in jets that keep time with the heart's beat, an *artery* has been cut. Venous hemorrhage is characterized by the dark blue color and steady flow or ooze of the blood, that is traveling slowly toward the heart, with no intermittent force-pump action as a *vis a tergo*. Neither this nor capillary hemorrhage,—bleeding from the minute vessels that connect the arterial with the venous system,— though often persistent, is as a rule alarming. Nature strives to check a hemorrhage by contracting the muscular fibres of the artery, thus closing the bleeding orifice; by retracting the artery within its sheath, and so giving the escaping blood a chance to coagulate in front of the wound and act as a plug; and by lowering the force of the heart's action, or suspending it entirely by inducing syncope or unconsciousness, thus favoring the process of coagulation or thickening of the escaped

blood, which forms an effective compress about the divided vessel.

In combating hemorrhage, we can do no better than to aid nature by copying and so reinforcing her methods. The one that we resort to instinctively is *pressure,* which should be applied directly upon the injured surface. Pressure with a clean finger on the bleeding point until a surgeon can arrive and tie the injured artery, is most effectual, or pressure with strips of cotton cloth (a torn-up shirt or petticoat) packed solidly into the wound and bound in place with a bandage, a pair of suspenders admirably answering the purpose. In all cases of moderate bleeding, compression of this kind will be adequate. But if a large artery is injured, it should be compressed between the wound and the heart, against a bone if possible, and a hastily improvised *tourniquet,* properly applied, will keep up a uniform pressure and effectually stop bleeding beyond the point of application. For instance, a handkerchief, strip of clothing, or half a suspender tied around a limb above the wound, with a pad, piece of wood or stone, or bunch of sod, under it and over the artery,—which may usually be felt pulsating beneath the fingers if its course is approximately known,—constitutes a perfectly adapted field tourniquet. A stick is next to be passed under the handkerchief or bandage on the opposite side of the limb and twisted around until the compress used crowds firmly on the artery. Hemorrhage is thus immediately checked. Pressure on the brachial or main artery of the arm, will stop bleeding in a lacerated hand. And if you will only remember that when fingers are amputated by a circular saw, or a hand is cut to pieces by machinery, or the forearm is mangled and the radical artery at which we count the pulse is severed, that a hemorrhage which might otherwise be fatal may be temporarily controlled by simply placing a book or a large wallet, a block of wood, or hard piece of turf, or a round stone, high up in the armpit and then pressing the arm firmly against the chest walls, you may be instrumental in saving more than one life. Profuse hemorrhage from the palm may be checked by grasp-

ing a round stone firmly with the injured hand, and the fingers may be bound in this position with a handkerchief. An accident that often happens here in winter is cutting the foot with an ax while chopping. The consequent hemorrhage may be immediately controlled by bending the leg at the knee, over the back of a chair, a fence rail, or limb of a tree bent down for the purpose, so that pressure will be made on the popliteal artery behind the knee. The weight of the limb in this position will close the arterial channel. The main artery of the leg or femoral may be compressed where it passes over the bony pelvic brim into the thigh, or a tourniquet may be applied at the middle and inner aspect of the limb. In otherwise uncontrollable bleeding about the face, neck, or head, pressure must be made on the carotid artery, along the inner edge and lower half of the muscle that passes from the hard bone behind the ear to where the collar bone is attached to the breast bone. The thumb should be placed upon the artery (which is easily found by its pulsations); the fingers should clutch the back of the neck (thus the necessary purchase is secured), and the artery should be pushed backward against the spinal column. Direct pressure with the finger is the proper way of dealing with hemorrhage from the large veins of the neck. In all hemorrhage the patient should be placed on the back, with the head low, to keep blood in the brain. The contraction of the involuntary muscular fibres of the arteries is increased by the ergot of rye, administered in teaspoonful doses of the fluid extract. Stimulants must be given sparingly, as they increase the heart's action, and so are incompatible with nature's effort to induce syncope or swoon. But the repeated injection into the bowel of a pint of moderately hot water to which a teaspoonful of common salt has been added,—the salt fluid being designed to take the place of the blood that has escaped from the arteries,—will often avert fatal consequences in disastrous hemorrhages. The surgeon on arrival will apply a catgut ligature to each end of the divided vessel. The practice of stitching wounds with unsterilized needles, or attempting to tie arteries, by untrained persons, is discouraged. The former

may possibly result in blood-poisoning which imperils life. In case it is impossible to secure a surgeon, and stitches are absolutely necessary, they may be put in by a layman with safety if the needle used and the threads are boiled. All water employed in washing or dressing wounds should also be boiled. And here bear in mind that the popular idea of "catching cold" in a wound is a fallacy; it is infection by bacteria from uncleanliness that excites inflammation.

In all cases of internal hemorrhage, the fluid extract of ergot (which every farmer should be provided with) is to be immediately administered in teaspoonful doses diluted with water. In hemorrhage from the lungs, ice should be placed over the heart, morphia one fourth grain given in addition to the ergot, and all stimulants withheld, as they simply whip up the heart and contribute to the continuance of bleeding.

In the vomiting of blood,—which is dark, clotted, and apt to be mixed with particles of food,—and is thus distinguished from the blood of lung hemorrhage which is preceded by coughing, is bright red, frothy, and mixed with bubbles of air—place the ice bag full of pounded ice or cloths wet with ice water on the pit of the stomach, administer ice to be swallowed by the patient in small pieces, and one fourth grain tablet of morphine in a little ice water.

In hemorrhage from the bowels, absolute quiet and ice in an ice bladder on the abdomen, with the doses of ergot already described, are imperative. It is well to remember that a teaspoonful of turpentine in an emulsion of milk once an hour has long been regarded as a specific both in hemorrhage from the bowels and in hematuria, or bloody urine.

Nose-bleed is at times profuse enough to occasion alarm when ordinary means have failed to check it, and a doctor is not at hand to plug the nostrils. A teaspoonful of lemon juice turned through the nose after it has been cleaned of clots will often prove efficacious, as will also pressure with a roll of paper on the coronary artery between the upper lip and the gum.

Perhaps burns are second in importance and frequency to

hemorrhages, among the accidents that call for emergency treatment. One of the best applications for a common burn or scald is a saturated solution of baking soda. But in burns that involve a large skin area, or are accompanied with extensive destruction of the deeper tissues, the situation is extremely grave, as the patient is likely to die from shock due to some ill-understood change in the blood. The heart must be sustained in such cases from the start by a domestic stimulant, none more convenient than a mixture of whiskey and strong coffee, and the pain must be quieted by quarter grain doses of morphia repeated as often as necessary for the comfort of the patient. In no other condition are the speedy services of a collected and thoroughly accomplished physician more ardently to be prayed for, than in collapse consequent upon burning with steam, gasoline, or petroleum.

New Hampshire is a state of lakes, ponds, and rivers; drowning accidents are therefore not uncommon. Every adult in the state should know how to employ artificial respiration for the purpose of reviving persons rescued from the water. The following rules should be committed to memory by every New Hampshire farmer, and taught in every New Hampshire school-room:

The subject having been taken from the water, and if possible conveyed to a sheltered spot, loosen the clothing, turn the patient on his face, elevate the hips for a few moments, and let the head hang down, in order that water may drain from the lungs. Then lower the hips, place the face downward, with the forehead resting on one of the wrists, and the face turned to one side. Open the mouth; seize the tongue between the fingers covered with a handkerchief or piece of cloth, and draw it forward between the teeth; clear the mouth and throat from mucus, seaweed, or other extraneous substances by passing the forefinger, covered with a handkerchief or piece of cloth, far back into the mouth, thus opening a free passage to the windpipe.

Then turn the body face upward, shoulders resting on a folded coat; keep the tongue drawn forward; raise the arms

backward and upward to the sides of the head. (This expands the chest and allows the air to enter the lungs.) See Fig. 1.

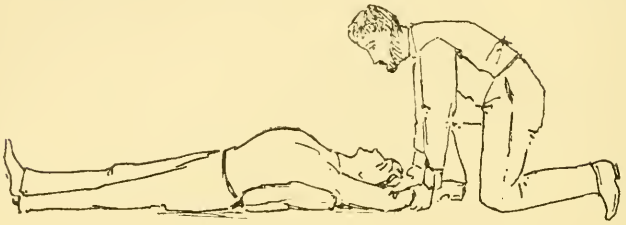

Fig. 1.

Then slowly move them downward, bending them so that the elbows will come to the sides and the hands cross on the pit of the stomach, and press them gently but strongly against the sides and chest. (This forces the air out of the lungs.) See Fig. 2. Continue these two movements (which produce artificial breathing) very deliberately about ten or twelve times in a minute, and without ceasing, until the patient breathes naturally, or until satisfied that life is extinct.

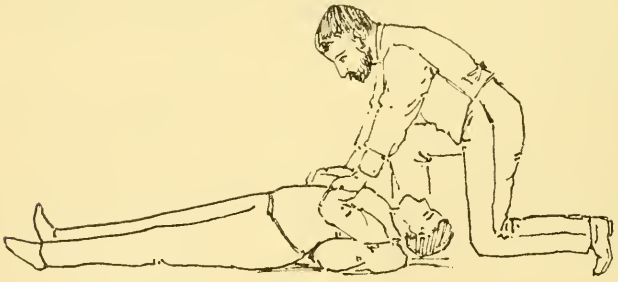

Fig. 2.

While this is being done, a little friction on the chest may be produced by rubbing gently with warm flannel, and the body may be stripped and wrapped in dry blankets.

After natural breathing begins, continue very gently, for a few minutes, the two movements which produced artificial breathing.

After natural breathing is fully restored, give the patient a

teaspoonful of brandy, hot sling, or tea, two or three times a minute, until the beating of the pulse can be felt at the wrist.

Rub the arms and legs upward, and the feet and hands with warm or dry flannel.

Apply hot cloths to the body, legs, and arms, and bottles of hot water to the feet.

CAUTIONS.

1. Do not be discouraged if animation does not return in a few minutes. The patient sometimes recovers after hours of labor.

2. Do not allow the tongue to fall back and close the windpipe while the arms are being worked.

3. Do not rub the legs and arms until natural breathing is restored.

4. Do not put any liquid into the mouth until natural breathing is fully restored.

5. Do not roll the body nor handle it roughly.

6. Do not allow the head to hang down.

These rules should be printed on cards by the State Board of Health, and distributed at all lake and seaside resorts, as they are about our wharves and harbor by the health department of Greater New York.

This method of artificial respiration is also useful in all cases of asphyxia, or suffocation, as where a babe is strangled by burying its nose too deeply in its mother's breast while nursing; in opium poisoning; in suffocation by illuminating gas, etc. Continuous submersion for five minutes is generally attended with fatal results, but there are cases on record where persons have remained under water a much longer time and been restored. Hence, it is our duty always to apply artificial respiration, and to persist for hours before abandoning hope. In one case known to the speaker, the subject, a lady, was under treatment for five hours before breathing was re-established.

Sunstroke and heat prostration are sufficiently common to demand notice. Exposure to the sun, particularly in the case of persons who are debilitated or addicted to the use of alco-

holic stimulants, may induce dizziness, nausea, and general weakness, accompanied with a very high temperature (110°F), rapid pulse, labored respiration, and sometimes delirium. The treatment is to apply cold water with great caution so as not to reduce the temperature too rapidly and cause fatal collapse. This condition is met by placing the patient in a cool room, stripping him naked, sprinkling his body with ice water from a common garden watering-pot, and rubbing him with ice until his temperature taken by the bowel is reduced to 101°F, or a little above the natural heat as determined by the hand placed on his skin. Cold applications are then to be stopped as the temperature will of itself continue to fall; the patient should be lightly covered in bed, and ice applied to the head to avert all danger of brain inflammation. Should the temperature rise again, return to the sprinkler. Should the pulse appear to be very weak after the fall of temperature, a little whiskey should be given.

Under the spray treatment above described, about 11 per cent of sun-struck patients die. This average has recently been reduced to 6 per cent by placing the subject, wrapped in a cotton sheet, on a table or lounge covered with rubber cloth, and then forcibly dashing dipperfuls of cold water on his body from a distance of several feet. In severe cases, this treatment may be reinforced by pouring a small stream of cold water, every three minutes, on the patient's head, from a height of five or six feet. Continue the intermittent dashing with water, and the douche to the head if necessary, until the temperature falls to 103° F. Then the patient is to be wrapped in blankets and surrounded by bottles of hot water. His temperature will gradually fall to normal (98 5-8° F.), and there is likely to be no secondary rise. The nerve stimulation resulting from the cold dashing and douching, and the reaction from the hot applications, explains the phenomenal success of this method of treating sunstroke.

Fainting from exposure to heat suggests removal to a cool place, and the administration of a diffusible stimulant, none superior to aromatic spirits of ammonia, a teaspoonful in a

wineglass of water. A four-ounce bottle of the aromatic spirits should be kept in every farmer's medicine chest, as it is a specific in all cases of fainting and heart exhaustion.

Exposure to intense cold is attended with great vital depression, and if continued for a length of time, congestion of the internal organs ensues, especially of the brain, as indicated by the development of coma and an irresistible desire for sleep. A patient suffering from the constitutional effects of cold—unconsciousness, feeble heart, shallow breathing, numbness and stiffness of the body—should be placed in bed in a cold room, and the temperature of the body gradually raised by rubbing with cold water. Meanwhile the heart should be stimulated with whiskey or ammonia, for there is always hope of resuscitation so long as the heart continues to beat; and if the respiratory movements are seriously impeded, artificial respiration must be employed. As the circulation improves, stimulants may be given and the room warmed; but it is a golden rule of medical practice, as well as the essence of common sense, never, under any circumstances, to allow the use of alcoholic stimulants during the period of exposure. Persons battling with a blizzard or lost in an ice storm, take their lives in their hands if they stimulate while out in the cold. The uplift of whiskey is quickly followed by an appalling reaction; depression becomes extreme, and susceptibility to freezing is manifestly increased. Such has been the experience of all Arctic explorers. Dr. Hayes told me that on one occasion he nearly lost a whole boat's crew by dealing the men out a little whiskey under circumstances of unusually severe exposure.

I realize that you are waiting to hear what I shall recommend for frost-bite; but I do not know that I can improve in any way upon your domestic treatment of this condition, which consists in removing the sufferer to a cold room and rubbing the frozen part with snow or ice water until sensation returns. Then elevate the limb for a time, wrapped in cloths wet with alcohol and water, to prevent congestion.

What are we to do when the baby has a convulsion, or some member of the family falls down in a fit, with six foot drifts

outside, and the doctor ten miles away, and no telephone? If it is a child, place it at once in a warm mustard bath, 96 or 97°F temperature (a handful of mustard to a tub of water), and keep it there till the skin reddens and the blood has thus been derived from the brain. Meanwhile, go to your medicine chest, take out a five grain tablet of chloral, dissolve it in a little warm water and inject it into the bowel of the child, using a few drops of chloroform on a handkerchief for inhalation while the chloral injection is preparing. The convulsion may be the premonitor of scarlet fever or diphtheria; it may be caused by worms, or by indigestion, by infamous store candy or green bananas. Remove such causes as the latter by an emetic dose of syrup of ipecac. And remember that the treatment in all green apple cases, or of cholera morbus, is a mustard poultice to the abdomen, and a tablespoonful of castor oil with fifteen drops of laudanum internally.

Little can be done by the layman in the convulsions that are apt to close the history of Bright's disease, beyond the administration of chloroform on a handkerchief and the warm bath. It is imperative that a physician should be on the ground as soon as possible. But in an apoplectic seizure, or "shock," the family can do as well as the doctor in the early treatment. Apoplexy is cerebral or brain hemorrhage. As soon as it occurs, go to the medicine chest, secure the dropper and the vial of croton oil, and place one drop on the patient's tongue. Put ice to his head, mustard to his feet, keep him on his back, and give him four drops of tincture of aconite every three hours till the fullness of the pulse is relaxed. No physician can do more.

For asthma, and neuralgia of the heart or angina, I have placed in the case a box of Nitrite of Amyl Perles, duly labeled. One of these is to be crushed in a handkerchief and inhaled by the patient. The same thing is excellent in an approaching epileptic fit. The tincture of lobelia, if given in teaspoonful doses every fifteen minutes until sickness of the stomach follows, is your treatment for bronchial asthma, which is sure to come on at most inopportune times.

Sometimes people swallow a small sharp article,—a piece of glass, oyster shell, or their false teeth. What is to be done? Do not attempt to vomit or purge them; but give them all they can eat of mashed potatoes, corn meal mush, or oatmeal porridge. At night have them lie on the right side to facilitate the passage of the article out of the stomach. Spend the next day on right side, with hips elevated, eating freely of the mashed potatoes. Keep this treatment up for three or four days, or until the foreign body comes away. Again, a penny, marble, piece of bone or food, bead, shoe-button, vial cork, pin, or collar button, becomes lodged in the upper portion of the air passages, or larynx, as the result of talking, laughing, sneezing, or sudden inspiration, while eating or holding the foreign body in the mouth. Vomiting while etherized or intoxicated is often a cause of the same accident. If the offending substance is not coughed up at once, alarming symptoms occur and strangulation may follow. A small body that passes through the larynx into the trachea or wind-pipe may move up and down with the patient's breath and occasion great distress; or it may pass down into the bronchial tubes and remain there for weeks, causing fatal abscess. A foreign body in the throat may sometimes be removed on the instant by the tip of the finger, the mouth being pried open with any convenient lever. If this fails, the body is to be inverted and the patient struck between the shoulders in the hope of exciting expulsive efforts. A surgeon only can operate.

A flexible catheter is an instrument that should be found in every family medicine chest, as retention of urine may occur from various causes, even through spasmodic contraction of the muscular fibres of the neck of the bladder from exposure to cold, and if relief be not afforded, great distress supervenes,—chills, fever, delirium, stupor, even death. I have known cases where farmers have brought this condition on themselves by walking out in the morning barefooted on the cold door rock. Habitual distention of the bladder from carelessness or lack of opportunity induces a paralytic condition of the walls which leads to retention; and there are

instances in which a single enforced act of retention through modesty has resulted in death. Somebody in every family should be instructed in the use of the catheter. When the bladder is wounded or ruptured by a fall on some sharp instrument, there is nothing to do but administer morphia and await the coming of a surgeon.

Horse kicks in the abdomen and similar contusions of the belly wall are to be treated by stimulants, and the application of ice until a surgeon assumes charge. If his coming is delayed, full doses of morphia should be given, one fourth grain at first dose and one eighth grain every hour thereafter for eight hours.

Of fractures or broken bones I shall not speak, for only an experienced surgeon has any business to meddle with them; but a few concluding words remain to be said about the antidotes for poisons. To poisoned persons, home treatment means life or death. There is no time to send for a physician; those in the immediate vicinity should act, and should know how to act, with certainty, promptness, and nerve. The first thing to do is to make the sufferer vomit as soon as possible, and this may be accomplished by having him swallow large quantities of warm soapsuds, or a pint of water in which two tablespoonfuls of mustard have been stirred, followed by the introduction of the finger into the throat. If no antidotes are at hand, follow with copious draughts of warm milk, or of water mixed with butter, lard, or oil. If possible, give the following antidotes:

For the common commercial acids, cooking soda (four teaspoonfuls in a glass of water), soap, or plaster scraped from the wall, pounded up, and mixed with water. Afterward olive oil or cream.

For carbolic acid, flour and water, white of egg.

For the common alkalies, like ammonia and lye, vinegar or lemon juice in water.

For bedbug poison or corrosive sublimate, poisoning by food cooked in copper vessels, green vitriol, give milk, white of eggs, or flour and water, in large quantities.

For potato-bug poison or Paris green, white arsenic or rat's-bane, and Rough on Rats, the hydrated oxide of iron with magnesia.

For lead poisoning, Epsom salts.

For matches, often eaten by children, magnesia and water or soapsuds.

For poisonous berries and mushrooms (symptoms, nausea, vomiting, purging, great depression, and sometimes stupor) emetics, Epsom salts, stimulants.

A general antidote that will neutralize a large number of poisons, I have included among the contents of our Farmers' Emergency case. It consists of equal parts of calcined magnesia, pulverized charcoal, and sesqui-oxide of iron, and is to be administered freely in water. After the poisons have been neutralized by their chemical complements, morphine and stimulants, when needed,—and demulcents like sweet oil, cream, and milk,—are not to be lost sight of, as they contribute essentially to recovery.

I have given some thought to the make-up of a farmer's family emergency case, and take pleasure in exhibiting to you the result of my experiments in this line. This case contains the following remedies and instruments:

CONTENTS OF CASE.

Instruments.

One hot water bag, one ice bag (to be used round the throat), one syringe, one graduated glass, one eye bath, one medicine dropper, one flexible catheter, two camel's hair brushes, one atomizer, some iodoform gauze and plain sterilized gauze, a little adhesive plaster, and absorbent cotton, and three or four roller bandages.

Drugs.

1. Mustard. To be used in making pastes. Dilute with flour according to requirements.

2. Nitrite Amyl Perles. Break one in a handkerchief and inhale in asthma, neuralgia of heart, and epileptic fit.

3. Croton oil. Drop one drop on tongue in apoplexy, stroke, or shock.

4. Aconite. One drop for child of six, and two drops for adult every hour in water, till six doses are given, to break fever. Use also as liniment, on cotton, in neuralgic pains, stiff muscles, etc.

5. Chloroform. Rub on with cotton. In intense pain can be mixed with aconite. A few drops breathed from a handkerchief for a child in convulsions, or a woman in labor.

6. Tincture of valerian. A teaspoonful in water for hysterics, nervousness, or rapid heart.

7. Tincture of lobelia. In severe asthma, a teaspoonful every fifteen or twenty minutes till nausea.

8. Unguentine. For burns, and where a salve is necessary.

9. White zinc ointment. To allay irritation and inflammation in sores and eruptions.

10. Morphine. One tablet every hour to allay pain. Stop when six are given; or two at one dose, in severe cases, to be repeated once.

11. Tincture of strophanthus. Heart tonic. Give seven drops in vertigo of old persons with one nitro-glycerine tablet. Give a drop every hour where heart failure is threatened, as in severe burns.

12. Cough mixture for children, No. 1.

Ol. Ricini,
Spts. etheris nitrosi,
Tinct. Opii Camph.,
Syrup ipecac,
Glycerine, of each, one ounce.

Dose, a teaspoonful every two hours.

13. Cough mixture for adults, No. 2.

Sol. morph. Magendie, one drachm.
Tinct. belladonne, one and one half drachms.
Calc. chlorid, ammon muriat., of each, one drachm.
Syrup aurant, two drachms.
Aq. menth. pip. ad, to fill a three ounce bottle.

Dose, a teaspoonful for child of eight; two teaspoonfuls for adult; three times a day.

14. Tincture of benzoin. A teaspoonful in a pint of boiling water. Inhale the steam in croup. Also use full strength to take soreness out of fresh cut.

15. Chloral tablets. Dissolve one in a little warm starch water, and give as injection in convulsions of young child.

16. Boric acid. Dissolve as many as a given quantity of hot water will take up. When cool, strain, and use as eye wash with the eye-bath, in inflamed eyes. Wash out ear with, in earache. Gargle or spray throat with. Use about private parts for itching. Wash burns and extensive sores with. Use as mouth wash.

17. Turpentine. Ten drops every three hours in bloody urine. Five drops on a lump of sugar in flatulence. Use as liniment, diluted one half with olive oil.

18. Olive oil. Use full doses to bring away gall stones in acute attacks.

19. Ergot. A teaspoonful in water in any hemorrhage.

20. Glycerine. To soften wax in ear, as a cause for earache. Inject a teaspoonful with a teaspoonful of water in case of an infant with convulsions from indigestible food. Two teaspoonfuls with a pint of soapsuds and a dessert-spoonful of salt as an injection for adult.

21. Salicin. For rheumatism. Give from two to five tablets three times a day according to severity of attack; and between meals a lithia tablet (22) in a glass of water.

22. Fifty carbonate lithia tablets, effervescent. One in water between meals in rheumatism and all acid conditions.

23. Chlorate of potash. A teaspoonful in a glass of water with a teaspoonful of iron as a gargle in sore throat.

24. Tincture of iron. As a frequent gargle. One teaspoonful in a glass of water, with chlorate of potash, when white patches are on the throat.

25. Whiskey. Heart stimulant in fainting.

26. Nitroglycerine. Give one in cases of heart failure where face is *pale* or *blue*. Repeat frequently until relief. Give in dizziness of old people three times a day.

27. Castor oil. A teaspoonful for infants passing milk

curds. Two tablespoonfuls with fifteen or twenty drops of laudanum for adults with pain from eating green fruits.

28. Atropine. Give one to baby when nose first begins to run, to avert cold. Give five to adult with five of the one grain quinine tablets.

General Antidote for Poisons.

29. Calcined magnesia,
Pulv. charcoal,
Sesqui-oxide iron, each one ounce.
Take by tablespoonful in water.

30. Pulv. opii,
Plumbi acetat, of each one drachm.
To make a lead and opium wash, mix with a pint of boiling water, and apply when cold, in beginning of erysipelas attack.

31. Quinine tablets. Take from five to ten, in chills. To avert cold, take ten with two of the Dover powder tablets in a glass of hot lemonade or hot beef tea, on going to bed. Remain indoors next day.

32. Dover powder. Take one or two to induce perspiration.

33. Calomel. Take three or four at bed time for biliousness, or in sudden attack of grip; one for a child. Follow, if necessary, in the morning, by a tablespoonful of Rochelle salts in water.

34. Laudanum. For external use, on poultices, in injections, etc. For internal use, twenty-five drops in water, for adult in pain.

35. Aromatic spirits of ammonia. A teaspoonful in water wherever a quick stimulant is necessary.

36. Cathartic pills. Take three to move the bowels in an adult.

37. Carbolic acid. A teaspoonful in a glass of water as a wash, gargle, or spray.

38. Pepsin, bismuth, and charcoal tablets. Take two fifteen minutes after eating in acute dyspepsia.

39. Migraine tablets. Take two for headache, and repeat in an hour if necessary.

40. Cholera mixture tablet. For diarrhœa take two first dose, and one after each loose movement until eight are taken.

41. Rochelle salts. For action on kidneys, a teaspoonful in a glass of water, repeated every hour. For action on the bowels, one or two tablespoonfuls in a glass of water.

42. Six poison ivy powders, each composed of one drachm sulphate zinc. Directions: Dissolve in one half pint of water and wash parts affected.

43. Toothache drops.

Chloroform, tinct. opii, of each, one and one half drachms.

Creosote, tinct. benzoin, of each two and one half drachms.

Apply on cotton.

44. Syrup ipecac. Teaspoonful dose, repeated in fifteen minutes, to induce vomiting in croup.

You will thus see that the emergency case is up to date, covers a large and varied chapter of accidents, and presents its remedies carefully explained by labels in connection with the emergencies they are intended to treat. Messrs. Bullard & Shedd of Keene have informed me that this case can be manufactured and put on the market for $8 retail. I have tried to keep the price down so as to bring it within reach of every farmer, and I can assure you that, apart from all life and health saving considerations, such a case will soon pay for itself in the sense of security that it brings the household that possesses it.

Mr. President, I know that I have far exceeded my time limit. In apologizing for thus trenching upon the rights of those who are to follow me I can only urge the importance of the subject you have asked me to consider.

Chairman Lyman: It was my fortune in youth to be surrounded by "the Joneses" on my right hand and at my left. They were blood relatives of mine. I have never moved to any town but I have found Joneses in the neighborhood. If I should take the wings of the morning and flee to the uttermost parts of the earth, lo! the Joneses would be there; if I

should make my bed in—Heaven, I should expect to find the Joneses there also. (Laughter). The farthest I ever journeyed to the southeast, I was met by a gentleman by the name of Jones, who invited me and my companions to come into his house and test what he had in his cellar. Now we did what many of you would not have done,—we took his word for it and did not test it.

Since Adam and Eve ate of those apples, the like of which I presented to you, there never has been any farmers' organization so extensive and so useful as that of the grange; and next in importance, I would almost say, to the president of the United States of America stands the master of the national grange.

It is my pleasure to now introduce to you that Jones from the West who occupies this high position—Hon. Aaron Jones, master of the National Grange.

THE SCOPE AND PURPOSE OF THE GRANGE.

HON. AARON JONES, INDIANA, MASTER NATIONAL GRANGE.

Mr. President, Ladies and Gentlemen:

Since the Jones family has been so highly extolled by the presiding officer, it may not be amiss to say, that originally all mankind was known as "The Joneses," but as they began to fall from grace, they were called "Lymans," and other common names.

We have only the brother's word for it that he did not test the product in the farmer's cellar.

It is indeed a great pleasure and honor to stand here today as a representative of the grange. As I am to speak to you on "The Scope and Purpose of the Grange," I will say as to the former, that it is a great national organization, extending as far as our country extends, into the territories as well as the states, and passing over into the Dominion of Canada, where it has a strong foothold.

This order is composed of the best type and class of American farmers, such as we have represented here to-day in the persons of your former honored president, and the vice-president and presiding officer of this meeting. As I am to be brief, I will pass on without further discussion of this point.

The main purpose of this order is the elevation, improvement, and advancement of the great agricultural industry of the country,—that great industry which lies as the base of every other industry in our nationality. I ask no apology for speaking on behalf of that which gives success and prosperity to the manufacturing of New England and the world, and to the commerce of the nation itself. Its chief object, as I have already stated, was to promote and advance the interests of this large class; first, by uniting them in one great fraternity, knowing no North, no East, no South, no West, having one common desire, to uplift the agricultural classes of our country, so that those who abandon our farms and go to the cities may leave behind them fresh life to keep the stream of the nation pure. Fraternity is one of the principal ideas of our

order, and, in my opinion, it has been one of the means of breaking down sectionalism. It was one of the measures by which those who wore the gray and the blue have come to understand one another better. It may seem strange, but it is nevertheless true, that, in the far West, there was a growing jealousy of the power and influence of New England thought, but this great fraternity has helped to break down all jealousies, and we are now one harmonious whole.

It was also intended to be a social organization. Its influence is not so strongly felt in New England, where neighbors are near at hand, but in the West, where a large territory is occupied by a single farmer, the grange is needed to acquaint the farmers with each other. As an illustration of this, I was called, as a representative of this order, to the Rocky Mountains, and made addresses throughout Colorado. There we found, where the farms were large, the people were actually starving to death from lack of social culture. I visited the master of the state grange in Colorado, formerly from New England, and I asked the good lady there how she liked Colorado. She replied, "I am *trying* to like it, because it is for our interest to be here; we can make more money, but we are starving for social commingling with our fellows. We need to associate with our neighbors; it makes us better citizens, and adds to our happiness." I suggested that she join the grange; then she would become acquainted with the farmers around her. Since I came away I received a letter from her stating that the grange was coming to her necessity, her whole being craving sociability.

Another feature is education. Education, as you know, lies at the base of the prosperity of this republic. As we view it, it is not the education of the text-books, not the education of our friend Quackenbos who has so splendidly addressed us, but education that lies along the line of the duties that come to every man sooner or later, when he has gone out from the schools into the world to win a livelihood. We want an *education of things*. The grange comes to the farmer as his school, making him a better farmer, and enabling him to reap

a larger per cent of profit, if you please, from his toil on the farm. We therefore believe education to be very desirable and very important. Education means instruction along the line of citizenship. We want to know just exactly what is the right of the various classes of our commonwealth. We want instruction along the line of our duties, and this is one of the important studies of life. We live in a country having various occupations, all equally important, yet there is a relative relationship that should exist between the manufacturing industries, the commercial industries, and the professional activities of the country. Our thirty millions of farmers in the United States cannot afford to make any mistake and claim more than what is right and proper; but we should hold our true position in life, and in order to do that we should know our relative position, therefore should make this a study. This opens up a great question,—a question of values, of prices, and of the relation that the farmer holds to all the industries, the manufacturing, the commercial, and the transportation interests of the nation. It is not for me in twenty minutes, I have not the time, nor the ability, nor the knowledge, to instruct you in this line; but it is a thing to be done throughout this broad land in the grange. In our meetings, from the Atlantic to the Golden Gate of the Pacific, these questions are being discussed and considered.

One other purpose is to direct the public mind along the lines of national and state legislation, and thus advance the common interests of all classes, nor can we afford to err in this. The grange, as an organization, is a conservative one. We rise above mere partisan politics, and our ideas come from the standpoint of citizenship alone. Men of all political affiliations and members of all churches join the order, and here they can take up the great questions of interest to the nation and discuss them simply upon their merits, and create a public sentiment in a way to advance the public weal.

I could cite many laws upon the statute books of the national congress placed there through the educational influence of this great order of ours. One political law of great moment,

the interstate commerce law, was passed on behalf, at the request, and through the education, of the Patrons of Husbandry. That law has been of great financial interest to the citizens of the United States. We read in last year's report that since 1888, the time when the interstate commerce commission was created, the saving to the American republic in the way of freights alone amounted to $525,000,000. This is a vast saving, and is in the right direction. It equalizes the cost of the productions of the farm as they go upon the table of the consumer. Now this ought to be relatively fair and right. I am largely interested in the transportation question. For instance, if I had a few thousand bushels of corn or wheat to transport to New York, if left to myself I might fix the rate too low and thus injure the transportation people; but, upon the other hand, if the matter was left to them, they, having no interest in the consumption, might make the price too high, and thereby a clash of interests would result. The grange undertook to see that there should be a law that should adjust the matter. Hence the interstate commerce commission. You will recollect, Brother Bachelder, when we were at Washington, that commission came before us and acknowledged they stood in the presence of the organization which gave them birth, and asked that we give them further information and influence.

Along other lines we have tried to focus the public mind. We have had no difficulty in this, because everybody in country and city alike, not engaged in matters with which it would interfere, has stood with us.

We thought we ought to have established by the national government, postal savings banks, so that money could be deposited in them, drawing a low rate of interest, perhaps, but absolutely secure.

Then we thought we ought to have a pure food law so that people might receive what they ordered, and adulterated foods should be done away with. I well remember the able article on this subject, read by Dr. Quackenbos a year ago.

We were also of the opinion that pooling ought to be pre-

vented. We believe the pooling of railways to their own interest ought to be abolished by law.

We believe in extending trade throughout the world. We think our consuls ought to look up countries where the products of the farm can be profitably sold, and the public mind has agreed with us in this.

We believe this national government ought to be close to the people of the republic, and we are in favor of the election of the senators of the United States by popular vote, so they will be directly controlled by the people of our country.

We are in favor of having all laws equitable and just, giving no special privileges to any, claiming none for ourselves. Let the laws fall with equal force and power upon every citizen of the republic.

In no place do we come into so close contact as in the matter of the delivery of the mails. We find they have made a line of demarcation here. The national government is paying out each year twelve to fourteen millions of dollars for the delivery of mails. We have no fault to find; but, my friends, if this nation can afford to go to New York and deliver mail to every fourth-rate lawyer, it ought to deliver it to the farmer as well, so that when our dear boys who have gone to fight for the stars and stripes write us, we shall not be compelled to hitch up old Dobbin to go and get their letters. Public sentiment has been started. To this national organization the farmers to-day owe the appropriation of $150,000 to continue this experiment, the measure having been defeated, but reconsidered and finally passed.

Now, friends, I have presented a few of the many great measures that are being brought about by the organized effort of the farmers as represented through this organization. But my time is up. We never think of asking a man to make a speech out West without giving him six hours, and it comes pretty hard to be sandwiched in here, and given twenty minutes to tell you what would take me two days to give you as a starting point. (Laughter.) But I want to say that, after all, what I have said is only a part of the work of our order.

We propose to build up in the country some of the pleasantest homes, with all the luxuries they have in the city; to educate our boys along the lines of honesty and integrity, and implant in them the true standards that distinguish men of worth and character; to build up our boys and girls into strong, influential men and women, pure in heart and character; to purify the channels of our government from beginning to end; and then, surrounded by nature, we should have the happiest homes that our republic affords.

Chairman Lyman: The time was when Athens was "the light of the world." The next bright spot on the earth was old Scotland, and she has sent many of her sons to bless America. No other man holds my humble reputation so much in his hands as does Dr. Murkland, whom I am to introduce to you, for it is not egotism on my part to say that the Agricultural College at Durham, over which he presides, certainly would not have had an existence there before 1910, if ever, had it not been for myself. Now if he makes it a great success, my reputation will be largely increased; if that college does not prove successful, I must go down to history in an humble way as an unwise legislator.

I have the pleasure of introducing to you Dr. Murkland, whose name indicates that his ancestors lived in the land of Wallace and of Bruce, and he himself is at the head of an institution from which we expect will go out the Deweys and the Schleys of agriculture, who will enhance the agricultural interests of this old Granite State.

THE NEW HAMPSHIRE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS.

DR. CHARLES S. MURKLAND, PRESIDENT.

Mr. Chairman, Ladies and Gentlemen:

If there is anything that could add to the weight of responsibility now resting upon me, it would be the necessity of carrying such an onus as has just been placed on my shoul-

ders; yet you must all understand, I think, that our supremest delight comes, in a measure, from the burdens we bear. So there is this added pleasure,—that his life is inwrought in the standing and destiny of the College of Agriculture and the Mechanic Arts.

I wondered, while the master was speaking, why he did not tell us of that other achievement of his body,—how, when there was some agitation at Washington as to whether the national money should be invested in this particular line, it was the power of the grange that turned the scale and made it possible to further the colleges already established throughout our union. In the dark days of the Rebellion, when Abraham Lincoln wrote that name among the list of names we honor in America, "I approve that bill. Abraham Lincoln," it was because he felt back of him the power of the common people, on the farms and in the workshops, in the country and in the city.

I am glad to represent here, as elsewhere, an institution that stands for the *newer* education. Education has become so common today,—a college education is so easily acquired today—that it leaves a student almost at sea. The time was (not many years ago) that to have a college education was to be distinguished; *now* one expects to have the college stamp on his life; and because it is so common, fifty to a hundred parents are wondering to-day what their sons will do after a college course, and as many sons and daughters are wondering also what they can do. In former times a college education prepared one, in a preliminary way, for one of the learned professions; a career was marked out for him; he was expected to be a doctor, a lawyer, or gentleman of leisure; but now, with the professions overcrowded (except at the top), the forward impulse of education has been toward the imparting of that good old term "faculty." They used to say of the genuine type of woman that she had faculty, that she could *do* things. I have been impressed within the last three months with the witness events have borne to that quality in our national life expressed by faculty. It was no accident that gave us one fleet after another with hardly the loss of a

man. Sometimes two ships may meet in action and one suffer and the other pass unscathed; but when the thing happens over and over, it is no longer in the realm of the accidental. I believe, with Captain Philip, that it was special providence that preserved our navies, but special because we have fostered the spirit of ingenuity, achievement, and accomplishment for which the word Yankee stands the world over. Because we could depend on the armor plate of our preparing, and on the nerve, the courage, and the character of the men we have been preparing, we have been under the special providence of the Almighty. Our school stands for that peculiar art preservative.

I have tried to insist always that there were no division lines between callings, certainly none so far as concerns the interests of the various callings. We are nearer the idea of the Socialists in America than anywhere else under the sun. We are bound together here as no other people is bound together. We have no agricultural interests that are separate; we have no commercial interests that are separate; our interests are one in the long run. It was a fine choice of words which made Emerson say: "The sacrifice of private interests to the public good."

Education, of all things, must not be exclusive; it is the most comprehensive thing imaginable. Then here is the problem,—how to face the demands of the progressive needs of our common life and at the same time keep our institutions upon such an intellectual basis as shall make them worthy of common respect.—and we are wrestling with it. I wish the man lived who could tell us how to solve the problem, and yet, I am not sure that I do, because some one else must arise tomorrow with another theory.

I am not likely personally to attempt to arraign the old education, for I owe to it all I have and am and hope for; but unless it is supplemented by something else—something you got on the farm and I in the shop—it is likely to leave the students stranded on the world. Charles Dudley Warner, the man who said of a certain street in Hartford, Connecticut,

that it reminded him of a gold dollar because there were one hundred cents in it,—this man said it was all well enough for the girls to go to college, but they ought to know something. Now this was rather severe; but the point is, after all, in college or out, we must get a knowledge of something. It is astonishing how little we know about anything, and how much knowledge of any one thing teaches us knowledge of everything else. Tennyson said:

> "Flower in the crannied wall,
> I pluck you out of the crannies;—
> Hold you here, root and all, in my hand,
> Little flower—but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is."

See what it means to know any one thing. If you could take a blade of grass and read its secret story to the uttermost letter, the universe would lie bare before you; and yet, we ought to know something so far as man may know anything.

That is the beginning. Next, and equally important, if we *know* something we must be able to *do* something. What sends the great army of the unemployed along our traveled ways? It is inefficiency. What makes the most serious difficulty you have on the farm—men have everywhere? It is getting men and women to do something—some one thing they can do and do thoroughly. We pride ourselves upon our ability to achieve. It is part of our birthright. But more and more, as the marvels of scientific studies are made known, and professional skill becomes more supreme, there comes the cry, "Give us boys and girls who shall not only know something, but can do something." George Herbert sang for all time, "Who sweeps a room, as for Thy laws, makes that and the action fine."

One thing more. After the knowing and the doing comes the *being*. A certain worthy gentleman who was speaking in prayer-meeting one night on the beatitudes, said: "Brethren, what beautiful words! You must all *be* something, and *being* implies an *attitude*." At the risk of platitude, I will say that

this is the simplest and sublimest thing the mind can conceive of in the line of possibilities. A man may think, if there be in him a substratum of manhood, that there is a persistent, conquering force in simple character that will carry him far if he has nothing else; but if he has knowledge, skill, firmness, and quickness, love, reverence, and devotion that make good manhood and womanhood—that is the thing we are trying to turn out in the College of Agriculture and the Mechanic Arts. And so, when I am asked how many students go out on the farms, I say, I will look over the list and see; but I do not consider that is much of my business. I have learned in my life to have a profound, reverent respect for the manifest will of the Almighty, and when God has directed that a boy should be an artist, shall I thwart his will by making him a machinist? This college stands as a college of the state of New Hampshire, as a college of the United States of America, for the farmers and the mechanics, and every other class. Its object is to teach and inspire. If it do this, it will be enough. That it has done this in the past there are instances enough to demonstrate; that it will do this in future, I believe, for know the noble men who make up our teaching corps and the boys and girls who come there as students.

I wish I might tell you all the things that might be told about our college; but our latch-string is always out, and it is impossible to tell the things you must see to understand.

Adjourned till 1.30 P. M.

AFTERNOON SESSION.

Meeting called to order at 1.30 by Chairman Lyman.

Chairman Lyman: Some eighty years ago there was a board of agriculture in New Hampshire, when Father Humphrey was a young man; probably he remembers it. There was in the town of Milford a gentleman who knew how to farm, and who could teach young farmers to win prosperity by farming. He also knew the way to Heaven, and led that

way as he pointed it out to his parishioners. The report of that board of agriculture was so good, almost entirely written by that clergyman and farmer, that it was republished a few years ago, and it is good agricultural reading today.

A number of years ago, at Concord, I formed the acquaintance of one of the grandest men physically (and an excellent man in other respects) I have ever met. His wife was the daughter of that old clergyman and farmer.

I afterwards became acquainted with that man's son, and the people of New Hampshire have had the good sense to elect that son governor of the state. The grandfather, father, and son were always able to admirably fill the positions to which they were called.

I have the pleasure to introduce to you His Excellency, George A. Ramsdell, governor of the state of New Hampshire.

ADDRESS BY GOV. GEORGE A. RAMSDELL.

I thank you for the allusions which you have been pleased to make to my honored grandfather and father, and I can say what cannot always be said of introductions—every word which you have said of those two men is true. I count that man unfortunate who has no one behind him whose good opinion he desires.

I am pleased to be here. One of the pleasantest things in connection with the office which I hold is the fact that it has enabled me to become better acquainted than ever before with the people of the state. I like to feel that I know personally a considerable number of my constituents. I am glad to be in Hampton, for, as I said last year, within rifle shot of this place my maternal ancestor settled.

But while I think of last year, I am moved to say that we are not living in exactly the same country of which we were citizens a year ago. We were very proud to style ourselves people of the United States at that time; we thought we had a great future, a large territory, and the confidence and respect

of the civilized world; but, think of it, my countrymen; think what rapid strides our country has made within twelve months, so far as the opinion of the world is concerned! We were a good people; we had strength, but it was undeveloped, and I cannot help thinking that the same remark applies to the people of any state, and particularly to New Hampshire,— that we do not fully understand the powers and resources which we possess. We were a very peaceful nation; we had some commerce; we had some battleships, but not very many fully rigged and in order for battle; but, fortunately, circumstances happened which roused the indignation and spirit of the American people, and almost as one man they arose and said, "It is time to take a hand in the affairs of the world, and to eradicate great and grievous wrongs." We went to war; we have built a navy, and to-day, instead of being a people staying at home, hardly thinking it possible we could engage in warfare with European nations, we are acknowledged to be one of the greatest powers of the world, both upon land and sea. It is not strange, therefore, that I feel as if I was addressing citizens of a different country from those to whom I spoke a year ago.

The history of the world is being rewritten, and to some extent the resources and opportunities for the development of the industries of New Hampshire have changed. I do not believe the people of Cuba are capable of self-government; at any rate, it will be years before we lose hold of the internal affairs of that island and of Porto Rico. We are going to have more extended markets. I don't know but we shall have the Philippines to civilize with our own institutions, though I have serious doubts whether we undertake so big a job as that.

Now, so far as our own state is concerned, I am constantly on the lookout to see what is going to happen to it for good or for evil. I have watched southern competition in the manufacture of cotton, and I am glad to say I believe that we can hold out against it, because our people are thrifty, our mills have been well managed, and capitalization and costs

have been kept down. Indeed, I have been most agreeably surprised to see what large improvements have yearly been made and paid for out of the annual earnings. Other things beng equal, we could not vie with the South. If there was no cotton mill in the state of New Hampshire there never would be one, in my opinion; but we can contend against the lower wages in the South and against the difference in transportation of the two sections until such time as wages are equalized; for as soon as the white blood there learns that larger wages are being paid in other sections of the country it will demand better pay, or come North. So it is a matter of congratulation that because we are thrifty and economical we shall successfully meet this cotton problem.

Another thing, we have had railroad controversies in the state,—selfish ones some of them, in which one corporation was pitted against another; but if we had no railroad system and were today called upon to build one as extensive as that we now possess, we could not begin to do it. We have an unusual extent of railroad mileage, and nobody can take it away from us. Were it not for this fact we should find it difficult to open up resources in the northern part of the state. We shall continue to have facilities and objects to attract the pleasure-loving public from all sections; and all these are matters of congratulation.

The problem of agriculture in New Hampshire is a serious one, but I think it will take care of itself. In my own town, a market-gardener with abundant resources in the way of hot-houses in the winter is raising an immense amount of garden produce, and is able to sell it for a large price in New York. I cannot tell what we are going to turn these acres to, but I believe we can turn them to a profitable purpose after we raise all the crops we need for ourselves and our cattle. I have great hope that whatever can be produced on New Hampshire soil will find a ready market. I believe I said last year, either here or at Keene, relative to what New Hampshire could do as a purely farming community, that I thought we ought to uphold the idea that New Hampshire

was a pretty good place to do farming in, and we must keep it before the people that we are in the farming business to stay. Our most estimable friend, Dr. Quackenbos, has possessed himself of a considerable territory in the vicinity of Sunapee lake, and is making that section to "blossom as the rose," and very attractive to the summer tourist. I think the doctor rather took exceptions to what I said in connection with summer visitors, which was something like this: I said if I was a farmer, I would rather farm my own acres than to black the boots of tourists even though they might be presidents and governors; and if I was a farmer's wife, I would rather overlook the process of making butter and cheese and be at the head of my own household than to wait on the guests. After thinking it over carefully, I will admit this was rather rhetorical, but somehow or other it did me good to say it. However, I do not wish to be understood as ignoring the fact that our present prosperity is largely due to the money paid in by our summer visitors. New Hampshire is a pretty good place to be born in, a good place to grow up in, a good place to go away from if you can do better by going away, and it is a good place to die in after an honorable life.

I hope Dr. Murkland is not here, because I want to say that I was immensely pleased with his address. It was unpretentious, not long, but one of the strongest to which I have ever listened, and a perfect gem in its ideas and construction. Most of you who belong to the grange were a little jealous of the college and of Dr. Murkland, but you did not know him. Now there never was a day, in my opinion, when the agricultural interests of New Hampshire were in so good hands and in so good condition as they are to-day; and I believe this agricultural college is a powerful factor in bringing about this state of things. I have attended two commencements there, and found that not so many farmers' sons are sent there to be educated as I should like to see. More ought to go from your neighborhood and mine. While the college did not get on as well as it might in connection with Dartmouth college, I think the agricultural students are benefited by coming in contact with those pursuing the scientific

courses. I think there is competition enough to inspire them to move along together; and if any one thinks they want too much solid instruction, he is mistaken. Young men want to be at a college which has the respect of the state. It means something to be at the college at Durham; students feel that they are studying at an institution whose discipline is creditable. It is also a good place to educate your daughters.

One word more, although not exactly in the line of the subjects presented, but I shall never have a better opportunity to say it. We are proud of New Hampshire for still another reason. Last year we reduced the state's indebtedness $317,000, which is more than it has ever been reduced in any one year since the war. Now, I have never felt like talking about it in a lofty manner and claiming that *I* had done this, although done under my administration. (A very good showing was also made under the preceding administration.) But I want to tell you farmers and friends, men of business, how this came about, because you must look after this thing in the future. In the first place, you had a governor who was pledged to economy; you had a president of the senate pledged to economy; you had a speaker of the house who was of the same mind; the chairman of the judiciary committee, and of the appropriation committee (Colonel Ellis of Keene) were also of the same mind, and somehow all our friends seemed to keep their eyes on the question of economy, and all of us (I cannot specify whom—I might say some were from Rockingham county—but there were some fifty of us) whenever we saw anything introduced into the legislature that ought not to go through, we stopped it. We did it simply by reasoning with the committee having the bill in charge, and not a single act was passed nor an appropriation made that was not just and right; and it was principally because the great body of the legislature was made up of farmers and business men who had a mind to save the state's money that the state suffered no harm. I fear the county treasurers are not watched so vigorously as the state treasurer has been for many years.

In conclusion I will say to you, see that you do everything possible to further the interests of the farmers, search out the best methods of managing your farms, and ascertain what is needed to produce the best crops; look out for education; send to the legislature men in favor of economy and right to everybody, and the state will be better fitted to handle the problems which the condition of national affairs will necessarily throw upon us.

Chairman Lyman: Of the organizations of which I spoke this morning, there are probably in our country at present a half million belonging to the granges. Now there is no man in this wide country, perhaps, that has done more to uphold, to enlarge, and to encourage these organizations than the gentleman whom I will next introduce to you. He occupies in the United States to-day the position of assistant secretary of agriculture. I recollect once saying as he rose before the audience that I saw a fresh reason why the Rebellion was not successful. He fought for the glorious old flag three years, and the rebels had a chance to shoot at him during that time, but they could not and did not hit him. Now a man that can't shoot, and a people that can't shoot ought not to be forever prospered.

I have the pleasure of introducing to you Brother J. H. Brigham, assistant secretary of agriculture for the United States.

A NATIONAL VIEW OF AGRICULTURE.

HON. J. H. BRIGHAM, WASHINGTON, D. C., ASSISTANT SECRETARY OF AGRICULTURE.

Our friend Lyman should not be too hard on those people down South on account of their marksmanship, because no man can get closer to the ground than I, when it is necessary.

It is always a pleasure to address my fellow citizens in New Hampshire, as I always feel sure of an attentive audience. Sometimes when we meet in localities like this, where there is

so much outside to attract attention, the young people will stray around; but today we have an advantage over the crowd,—on account of the rain they cannot stay outside.

Brother Bachelder has given me for a subject, "A National View of Agriculture." I do not know exactly how he expected me to tackle it, but I have collected a few statistics showing the magnitude and importance of the agriculture of the United States.

I sometimes think the farmers do not know the importance of their calling,—that is, how much depends on them. They do not understand, it seems to me, that agriculture is the foundation of all the great industries, and that upon their own labor and skill depends the prosperity of the country.

Farmers sometimes talk about being poor. Some of them are, perhaps, comparatively speaking; but yet, every year, or nearly every year, the statistics of the United States show that the agriculturists of our country produce enough to pay the entire cost of the late war, and have spending money left. The product of a single year, 1897, was $3,500,000,000,—a fabulous sum. Of this the cereals alone were worth $100,000,000. Hardly enough gold and silver have been mined since 1839 to buy the crop of a single year. Gold and silver have not been mined in sufficient quantities in the United States in any year to pay for half the eggs laid by the farmers' hens. There is not enough gold and silver mined in the whole world in a year to buy the wheat crop of the United States. If we had all the money in the national treasury, all the money in circulation among the people and hidden away in stocking legs, if we had it all in a lump sum and started out to buy the produce for a single year, we should have to get trusted; we should not have money enough to buy it. I speak of this, not to show there is a shortage of money in circulation, but to show the independence and the wealth that comes from the labor of these men and women on the farms of the United States. This year the exports we sent abroad amounted to $1,210,000,000 in round numbers,—the largest in the history of our country, an increase over last

year of almost $178,000,000 in round numbers. Of this the agricultural exports were 70 per cent of the total—$854,000,000 in round numbers—a gain over last year. That is what the farmers have been doing in this fiscal year of 1898.

The exports in 1898 exceeded the imports by about $594,000,000. I read a speech of a certain politician, who said that we sustained a loss, that it was a disadvantage to sell more than we buy. I can hardly see it in that light. We are getting the best end of it when we sell more than we buy. In the last two years we have sent abroad $861,000,000 more than we imported from other countries. Now then, this gives us a balance of trade in our favor. If we continue along this line, it will not be many years till all the securities held abroad, issued to pay the expenses of the late war, will be returned to our country paid off.

Sometimes when we are exporting our agricultural products at a low price, we feel that it leaves but little profit for the farmer. That is true if we take a narrow view of the subject. We have sent a great amount of corn abroad, largely, no doubt, because of the fact that the price was low. Perhaps there was but little profit for the farmer; but when those people learn to use the American corn and understand its value, they will continue to buy when prices are more favorable, and then we will gather our profit.

Last year I think we sent abroad apples at a very low price, so low it did not seem to leave any margin for the grower, but it was not a loss. Those people over there never knew what it was to eat a good apple, unless they visited our apple orchards; they don't grow good apples there. When they have learned to appreciate our New Hampshire apples they will not stop buying because the price is comparatively high. When prices are low, and we ship our products abroad we are educating the people to consume them, and we are laying the foundation for future profit for the agriculturists of our country. There is consolation in this fact when we take low prices because of large product.

Now I presume I am expected to say something about what

the department of agriculture is trying to do to help the farmer. You have heard a good many phases of the agricultural interests discussed this afternoon, and I will keep off the ground so amply covered by these gentlemen as much as possible. The department of agriculture was created because the farmers of this country demanded it, as they believed this foundation interest of our country should receive more attention from the national government than it had ever received before. We have in charge of this department what we desired, namely, some practical farmers. A short time ago, the secretary sent out to chiefs of departments some queries, and asked them to report to him in detail what they were doing in this direction to help the American farmer. It was the first time they had been asked that question. It put every one on his mettle. Some gentleman told me how many questions had been fired by them recently. The chief of each division knew very well if he had not much to report he must have something next time, and he will do what he can with the force under his command to help the American farmer.

Now then, we realize that it is very important to have markets for what we have to sell. We must find somebody that wants to buy, and has the money to pay, or there will be no profit for the American farmer. That is one of the works in which the agricultural department is now engaged. We are working to extend our markets abroad. We make the best cheese and butter in the world, but the world does not know that fact. We have also made something that was not butter, and we have made filled cheeses and sent them abroad, thinking to fool those people. It has injured our market, and now the agricultural department is going to show them that we do make good butter and cheese. We have agents abroad, and they are putting our products side by side with those of other countries, and they are selling readily, and we propose to extend this market, and in that way we can help the farmer.

We desire to ascertain all we can with reference to conditions abroad. We are sending agents to find out all the facts

that will be of value to us. We have sent our men into the wilds of Russia, where they had to take a guide and armed guard for protection, searching for days for plants to be introduced into this country with profit. It takes money, but we expect the expenditure of a few thousands will bring forth millions in years to come. One plant was introduced into this country, and distributed by the agricultural department, which was worth more to the farmers of the United States than the entire cost of the department since its foundation. What has been done in the past can be done again.

We find competition is becoming so sharp in foreign countries they are trying to shut our products out. They discovered there was something in our pork that was diseased and unwholesome. The department of agriculture will inspect our meats so carefully those people cannot truthfully say they are not wholesome food. We shall force it upon them, and if the real cause for shutting out our products shall not be acknowledged, and they continue to exclude them, the agricultural department has its agents to work now to find out what is the matter with some of the products they send into our country, and there will be retaliation if necessary, and we will not be the sufferers in that sort of warfare.

The agricultural department is trying to perfect the weather reporting system and the crop reporting system. Of course there are many jokes fired off at the agricultural department about the weather department; but eighty per cent of the predictions prove to be true, and the most intelligent farmers of our country today are watching these reports very carefully, and find it saves them loss frequently, because they make note of that fact. We can improve this system beyond a doubt, and make it more valuable to the American farmer. Of course others will be benefited also. We will do all in our power along this line. It would be of great value to the farmer if he knew the condition of the crop in this country and the world before he markets his crop. We will try to ascertain the facts. Perhaps we cannot get at them so closely as to know the number of bushels in any one year, but we can

get at it approximately. The great difficulty is to know the acreage. All else becomes easy.

We think it is very important for our farmers to produce some of the things we buy of foreign countries. We are buying a large amount of agricultural products from foreign countries, amounting some years to nearly $400,000,000. Some of these we cannot produce much of. We ought to produce all the sugar needed to sweeten the American people. The agricultural department is directing attention to this work, and we think in a few years we will produce all we need, and possibly have some to sell.

We will not stop here. We have professional men searching every nook and corner of the old world to find some things we can produce here. There is hardly any limit to what the department can do in this direction, and I assure you the department of agriculture will not be stingy in expending money. We are not there for the purpose of turning money appropriated for the benefit of agriculture back into the treasury.

We find farmers are suffering because they come in competition with fraudulent goods, with imitation goods, and the law has not been enforced very rigidly. Men have openly sold oleomargarine right in the city of Washington, and frequently, when caught, they settle for a small sum of money with the treasury. Our officials get so in the habit of having money all their way that last summer we caught some of them attempting to settle a case. I talked with the secretary about it, and we thought it was better not to permit them to settle, but to prosecute them, and the agricultural department went to work with all their influence, and the president of the United States said, "Henceforth when we have a good case against them we will prosecute them to the bitter end." The agricultural department is going to work along that line.

Some other legislation may be needed for the protection of agriculture. There are sharp men trying all the time to devise ways and means of obtaining money without going through the slow operation which the farmer is compelled to

go through in order to reach his profits. We are going to use the influence of the department to secure needed legislation. The department will keep in touch with all agricultural organizations. We believe that to be wise. They may sometimes advocate something not exactly wise, but out of organized effort honestly made there will come good to the people represented. We believe that, and we are gathering in all the information possible in regard to these various associations and organizations, and keeping close touch with them and calling on them for help when we need it, and giving them all the help we can give as a national department in that work.

The department is carefully investigating the diseases of fruit, and we have some of the best men in the country at work. They are experimenting, and the result of their work will be of great value to the farmers and all interested in having something to eat that is palatable and free from disease.

The department is trying to encourage improvement in stock. We find in the West hundreds and thousands of horses not worth their hides, and yet there is a demand for good horses, particularly in this late war. We are going to find out for ourselves what horses are wanted and will be paid for, and advise farmers in the West what kind to raise. What is true of horses is true of other stock.

Now I have told you a few things we are trying to do for farmers. We are groping along many lines, not knowing exactly where and how to do what we are striving for, but we are trying to get information and devise ways. As a department we shall do our very best, and now I am going to ask what you are going to do to help yourselves. The department can do something; your agricultural college can do something; your state board of agriculture can do something; but they can do very little unless the farmers will put their own shoulders to the wheel and become a moving force and power to build up American agriculture. I want the farmers to think of that. I want them to understand that they

have something to do that no one else in all the world can do for them, and they must do their work well. They must organize, educate, drill, and discipline their forces, and when the time comes that they need all that it means—all the power and influence that organization, that drill and discipline means—they will be ready. We have been surprised, and the world has been surprised, at what we as a nation have wrought on the high seas and on the battle fields in 1898; but I want to say to you that that victory at Manila—the foundation for it—was laid in a home in New England. (Applause.) The boys must grow somewhere to meet the demands that may be made upon them in the future; you must be growing them in New England. Continue to make those boys and girls here in your homes a power for good not only in the community where they live, but in the entire country and in the world. The farmers can do a great deal in that line. The purest, best, brightest, and happiest homes in all the world should be those upon the farms in our country. If they are not such, the fault is with the farmer, and you must remedy such. We must do all we can to promote education among farmers, and a feeling of fraternity. One of the most notable things in this late war is the fact that we stand as a united nation, having irresistible power. That is one of the grand things coming out of this struggle. There will be division in politics and religion, but henceforth and forever, or at least so far as the mind of man can run into the future, we are to be a united people, under one flag, and here in this United States of America is to grow the greatest nation of people in all the world, capable of governing ourselves and this vast republic, able to advise, and with the power to enforce justice and right among other nations of the world in all international difficulties. It is now understood as never before by our own people and by the world that henceforth the United States of America, if not *the* power in the world, is one of the great powers. We do not purpose to encroach on the rights of other people, but the United States of America and her flag and citizens will stand for what is right and just between man and man the

world over, and we owe this largely to our fathers and mothers that have reared the men who are fighting the battles today and directing its government. I tell you, my friends, the greatest battles ever fought were fought by the mothers of men. So it has been in the past; so it will be in the future, and, knowing as I do, the influences at work, I have great hope for the future of our country.

I thank you for your attention, and if there is anything you want (except an office) in the department of agriculture, send for it; if it is loose you shall have it. We want to know what you want. If we do not have it, we will try to get it. Come and see us when you come to Washington. The latch-string hangs out. Glad to be of service to you; glad to see you. We should get lonesome down there if the farmers did not come to see us. We want you to feel and know that the department of agriculture has one object in view above all others, and that is to serve the American farmer.

Chairman Lyman:

Ladies and Gentlemen,—If the last speech we listened to was not a good one, I am no judge. I hope the band will excuse us. They played their part so well before, we thought it was a reality.

Pretty soon will be the hour for dispersion, and we shall all need a good road to go home on. Some people in the audience undoubtedly have read in an old volume—I hope it is not out of fashion—that "Wise men came from the East"; and those who are familiar with the history of our state know that it was very early that the (East-mans) came to New Hampshire and settled, and have been a blessing to the state. It is said that "Jordan is a hard road to travel," but we trust that the roads of New Hampshire, especially those which lead up and down among our mountain scenery, may be easy to travel.

Upon this important subject of "Good Roads" I have the pleasure to introduce a man from the East—one of the wise men of the East—Hon. Samuel C. Eastman of Concord, N. H.

A NORWEGIAN ROAD.

BY HON. SAMUEL C. EASTMAN, CONCORD.

The physical characteristics of Norway present a series of surprises to a citizen of our own state. Yet a general description may be given in terms that would seem applicable to New Hampshire. The north and west parts of it are mountainous and rocky, while the southeast is comparatively flat and contains much excellent arable land. But when we leave this general description and enter upon details, the necessary exaggeration of the general terms brings out the difference in strong relief.

The northern and southern boundaries of Norway are in very nearly the same degrees of latitude as Alaska. The influence of the Gulf of Mexico, diffusing upon its shores its stores of tropical heat, by the spreading out of the Gulf stream, gives it a more equable and moderate climate than is to be found in some parts of New Hampshire. It is true that the summers are shorter, and the midday heat is always followed by a midnight coolness, notwithstanding the long day, but the winters, though very long, are less intense than our own in the region bordering on the Atlantic.

It has a seacoast of over 2,000 miles, bordered on the west by a line of islands so continuous that, in a sail of 1,100 or 1,200 miles from Stavanger to the North Cape, it is the rare exception when, for more than an hour or two at a time, the vessel is not sailing in smooth water. The immediate shore on the southern half of Norway is not very high and consists of generally rounded, solid, obstinate looking, barren ledges, on which are a few fishermen's huts, and little or no vegetation. As you go inland the land rises often very abruptly, so that you have precipitous, almost perpendicular, cliffs of 2,000 or 3,000 feet elevation and beyond the ridges a general tableland of large extent, with mountain peaks averaging about the height of our Mt. Washington range, but with many higher elevations, the highest of which is 8,400 feet above sea level. This tableland, *fjeld* as it is called in Norway, contains the

largest icefields in Europe, feeding numerous glaciers of great beauty and grandeur. The limit of perpetual ice is little over 3,000 feet above the sea, and this creates a condition which makes the mountains of Norway entirely different from the mountains of our own state.

There is another feature of the physical condition of Norway which must not be forgotten. The whole of the west coast, in addition to its remarkable guard of islands, is broken by inlets from the sea extending from 50 to 100 miles into the interior, each with numerous branches or ramifications. On the shore the water is not very deep, 600 feet and upwards; but, as these inlets, which are called *fjords,* penetrate the interior, the water deepens to an extreme of 4,000 feet. It is also a curious fact that as the water deepens the land rises, and often the width of the *fjord* diminishes so that it is not infrequent that the mountains rise from the *fjords* to an elevation of 3,000, and in a few cases to 5,000 feet. These *fjords* are all navigable and constitute the principal highways for a large part of western Norway. In fact, they cut up the land so much that continuous roads of any kind near the Atlantic, north and south, for any great distance, are impossible.

From the ends of these *fjords,* as a rule, there are valleys which lead to the elevated tablelands and are the passes, or notches as we call them in New Hampshire, which render it possible to build highways. The ascent by these valleys is generally very steep. The descent towards the east and southeast is less steep. The west contains little arable land, while the eastern slopes are more fertile. What land there is that is suitable for cultivation on the Atlantic slope is generally to be found at the end of one of the valleys, where a glacier has gradually receded, leaving a comparatively level patch of land, with a stream from the icefields flowing through it. These rivers have their high water in the summer months, the heat of the sun melting the ice.

These characteristics, coupled with long days and unending twilight in the southern, and the midnight sun in the northern, part, have created a land of wonderfully grand and sub-

lime mountain views of great beauty. The mountains are studded with picturesque waterfalls of 1,000 to 3,000 feet in height, pouring down from the snow and icefields. In one case, in the Geiranger Fjord, the river is divided into seven streams of different volume and falls by a descent of 2,000 feet into the salt water of the *fjord* below. On the cliff opposite, which is not quite so precipitous, you see a little farmhouse and a cow feeding on a little green spot, 1,500 feet above the sea, and it looks as if they would all slide off down the cliff. You follow with your eye the path that leads to the house and you wonder how that cow ever reached the little farm and are sure that she can never come down alive. In many places you see these green spots on high places, which look inaccessible and yet are plainly cultivated. It is impossible for a horse to bring down the crops, and it does not seem as if even a sure footed mountaineer could carry enough on his back to make the cultivation pay. Nor does he. Your hardy Norwegian knows a trick worth several of that. When you least expect it, a large body apparently jumps out from the side of the mountain, flies swiftly through the air and come to a sudden stop by the roadside. Then you learn the meaning of the wires that are stretched from various places to the mountains above. They are trolley wires by which the hay and wood are carried to the farmer's barn.

The attractions which I have mentioned, and the trout and salmon fishing in the streams and in the mountain lakes, have made Norway a summer resort for the English for many years, and the fondness of the present German emperor for its scenery, which leads him to visit it in his yacht every summer, has set the fashion for the Germans also; so that there are now nearly as many Germans as English among the summer visitors. The annual crop of summer travel has become as important a feature in this part of Norway as it is in our White Mountain region, and the people get more money from that than from their fisheries or their farming.

It is this crop, more than anything else, which has led to the development of their main highways, and this hasty

description seemed to me to be a necessary introduction to one of the Norwegian roads.

Merok is at the end of the Geiranger Fjord, nearly a hundred miles from the coast, but still on salt water. Excepting the narrow pass through which the steamer sails, which from its windings can hardly be distinguished from the surrounding heights, the Fjord is a small basin, wholly surrounded by mountains 5,000 feet high, the upper parts of which, where they were not too steep, covered with snow. Along the shore line, for half a mile, are little sheds, boat houses, and small dwellings. A road can be seen creeping up the side of the slope obliquely for a short distance till it reaches a little church, and then turning abruptly in the opposite incline to a hotel. All the buildings are of wood, built of squared pieces of timber, six or eight inches square, placed one upon the other.

Our immediate destination is Grotli, a station, not a village, on the mountain plateau. Our conveyance is a small wagon on two wheels, drawn by a single horse. Formerly this wagon, or cart, had no springs except what came from the two elastic arms on which the seat rested, one end of which was fastened to the front of the wagon, while the other supported the seat. Now the presence of the summer guest has secured the modification of steel springs under the wagon body. Behind the seat, which holds two, and with separate adjustment, is a single seat, on which the owner sits and drives. Your baggage is placed under his feet and must be moderate in size. The owner will allow you to drive going up hill or on level ground. In fact, he is generally walking on all ascending ground. Down hill he won't trust you. He is apt to reach over and take the reins and say, as he did to my companion, who was fond of driving, "The young lady cannot drive."

The road before us is as hard and smooth as a floor. We shall find it so for the whole twenty-five miles that is to be our day's journey. Not a long day's ride for such a road, but unfortunately there is no hotel beyond for another twenty-five miles. The road is narrow, wide enough for two ordinary

carriages to pass each other in most places, and where by reason of expense in construction it is made only wide enough for one, turning out places are provided at reasonable intervals. The road in places has a little loose dirt on the surface from the wear of the material, which in sunny weather, in the middle of the day, supplies more dust than is always agreeable. The surface is higher in the center than on the sides, just enough to keep the rain water out of the road. On each side, unless there is a sheer descent, are ditches at least a foot deep, with frequent culverts, which are not at all noticeable on the roadbed, to carry the accumulations to the lower side. On the outside large blocks of stone are placed at intervals of about three feet to keep you on the road, and, in very exposed places, an iron rail in addition. As we begin to ascend, it is noticeable that there is a standard of grade that is never exceeded, though there may be places where it is not reached. When any elevation is gained, it is not lost by any slight depression in the surface. The grade is maintained by filling in with more uniformity than in most of our older railroads.

The mountain we are climbing is very steep. We find that by taking short cuts and going up places like climbing stairs, we can save by a foot path quite long distances traveled by the horse. This we do occasionally for variety and amusement. The highway goes quite a long distance on the mountainside in one direction, then it turns and doubles on its track, always gaining in elevation, so that you presently look down on three or four roads below you at different intervals. After ten miles on the highway, in which your horse has never gone faster than a walk, you have reached the highest point on the road, 3,400 feet above the sea, and you are then three and a half miles from the point at which you started. The steepest grade is about 400 feet to the mile.

For a part of the distance the road literally clings to the side of a precipitous cliff. You look down hundreds of feet to the valley below you, and only as a curve brings portions of the wall in sight can you see how it is that a support is obtained. In some places it is blasted out of the solid rock,

with the cliff overhanging the road. On many of the roads, though not on this particular one, there are tunnels, which are generally short. Here and there where the cliff is very steep, the side of the road goes down 100 feet in solid masonry before it finds a sure foundation. In another place, it was found to be the easiest way of surmounting a particularly difficult climb for the road to describe a circle and pass over itself by a bridge to a new elevation.

At regular intervals stones are placed stating exact distance from the sea, and other tablets commemorate the progress made during each of the seven years, during which it was constructed. Other stones note the elevation above the sea level, each hundred metres, or about 325 feet, having its mark.

The twenty-five miles covered by the day's journey was finished in 1889. It is a masterpiece of engineering. It is difficult to give an adequate idea of its beauty, its solidity, its perfect condition, and its fitness for the work for which it was designed. Before the road was built no tourist made the attempt to surmount the pass. Now the glorious scenery is enjoyed by hundreds. The fjord lies at the bottom of the basin formed by the steep sides of the inclosing mountains, which tower above you in all directions. On the higher slopes are large fields of snow, from which flow the streams that feed the cascades, visible in every direction, now what seems to be a tiny thread of silver, and again the large stream that divides into the falls of the "Seven sisters." By the side of the road flows a turbulent mountain stream, breaking now and anon into cascades of entrancing beauty.

When the summit is reached, the road skirts a large mountain lake, still surrounded by the higher peaks. On its shores is a little mountain inn, where dinner is served, and which offers a primitive shelter to those whom nightfall surprises in the vicinity.

Grotli, where we stop for the night, is a mountain inn, belonging to the government, in a typical *fjeld* solitude. We left summer at the sea level in the morning. We pass the night on a treeless plain, surrounded though at some little

distance by mountain peaks, from whose snowy summits, crowned with rosy tints from the setting sun, which long lingers on the horizon to display the glories of the Norwegian hills, chilly breezes at length drive us to seek shelter.

These distant peaks possess a strange fascination. A party is to start the next day for Jotunheim, a large tract of the country nearly up to the snow line, with mountain lakes and lofty peaks, where the only shelter is afforded by the huts of the Norwegian tourist clubs. A young gentleman and his sister from Holland are of the number, and they anticipate great pleasure from the trip. It must be a strange contrast to the level monotony of their native land.

This road continues on down the gentle slope for a hundred miles to Lake Mjoesen, a lake with scenery much like Winnipesaukee. The next day, however, we start for the sea level by the Stryn road, a little longer than, but very like, the one by which we ascended. We were warned by a Norwegian friend to make the journey in this direction for the sake of the views of wonderful beauty and grandeur which the descent afforded. I cannot imagine anything that could surpass it. This road was completed in 1895 and has the same series of windings as the one from Merok. In one place the road crosses a narrow ravine, 300 feet deep, on a curved stone-arch bridge. It seemed safe, but the idea of building it caused a shudder.

I might tell you of other roads,—of one along the shores of a lake, where till ten years ago, the only way of getting from one village to another was by boat in summer and on the ice in winter, and where now a road has been almost hewn out of the rock walls which surround it, four miles of which cost $32,000; or of another where the old road, which still was passable, and would be called a good road here and was about two miles long, was replaced by a new one nearly twice as long at a cost of $20,000, simply to secure a more practicable grade.

Enterprises such as these, in regions where the population is sparse and the country is poor, cannot be carried on locally. It is only by the state that such highways can be constructed,

and it requires a broadness of view on the part of the people to submit to raise money by taxation to be expended far from home. Norway, with its two millions of inhabitants, is now expending annually nearly $500,000 on the construction of these highways, requiring a local addition of about $100,000 from the districts where the money is expended.

When you remember that a day's wages for the men employed upon these works is less than one fourth what it is with us, and the sum expended must be correspondingly increased if compared with our own standards, you will have a better comprehension of the practical application of their belief in good roads. Yet they do this because they believe it pays. The visitors from richer countries—the summer travel, which leaves gold behind—has increased to an incredible degree since the building of good highways was begun. Fifty years ago there were few decently passable roads, except in and near the cities and in the southern and eastern parts of Norway. The tourist visited the coast, sailed on the *fjords* and went away when he could no longer enjoy a life on board ship. The steamers were small and inconvenient. Now Norway is thronged with visitors, new hotels are springing up on all the main highways and the best of them are sure to be crowded. To be sure, the old travelers shake their heads and long for the good old days when the charge was fifty cents a day, even if it was doubtful if you got your money's worth at that. But the people are reaping the harvest. They are better clothed, live in more comfortable houses, have better food, better schools, and are no longer so isolated and shut out from contact with the world. It is true they still dry their hay on racks, but that is because the climate is such that you cannot cure it on the ground. The women and girls work in the fields, partly because the season is so short in which the work must be done, and partly, no doubt, because our labor saving tools are not available on their small, rough, and often inaccessible fields.

How are these roads built? Down to 1860, the construction of the state roads was in the hands of the army officers,

who are stationed all over the country and have charge of the drilling of the militia. They were all university graduates and had had special instruction in engineering. Since then the construction of highways has been a separate civil department, with engineers who have been through one of the Norwegian technical schools, and had a subsequent year's study in similar, more advanced institutions in German. There is a head of the department and five engineers in the office in Christiania, and forty-four engineers in the field. The pay of the engineers ranges from $260 for the first year's service of engineers on probation, of whom there are six and whose pay is $325 the second year and $400 the third, to $1,400 for the chief of staff in the central office. In spite of the very moderate scale of salaries, these men do excellent work and the engineering of the roads excites universal admiration.

As a result of many years' experience, a manual, or perhaps I should say specifications have been prepared for the construction of highways under the various conditions to be found in Norway. Carefully drawn plans are also printed showing how the roadbeds are to be made. For instance, in all places where the road does not rest upon solid rock, the bed, unless it is to be made higher than the natural level, is excavated for three feet. The bottom is paved with round or square stones, as may be more available, of about the size of a man's head, of substantially uniform size, with no attempt, however, to make close joints. The object is to secure a solid foundation for what comes above. If the ground is very soft the depth of this layer is increased. This and the next layer constitute what the English call the metal. On this foundation is placed a thick layer of stone, broken into rather large pieces. It is well compacted together and forms a stratum of the road from which any water that may penetrate the surface will readily drain away. There are two or three layers of stone of different sizes, and the last layer consists of the hardest stone available in the vicinity, which can be broken into irregular pieces somewhat globular in form, and from which all small pieces and dust are excluded, as well as all pieces that

will not go through a circular ring a little more than two inches in diameter. This last point is strenuously insisted on. All the different layers of strata should be composed of material of uniform size, but this is especially important in the last stone layer. Stones of a size larger than the average have a very provoking way of creeping to the surface where they are not wanted, another instance of the total depravity of inanimate things.

These layers are now made thoroughly solid and smooth by rolling and a top coating of screened gravel, from which all stones of an appreciable size have been removed, completes the process. The road is slightly convex so that the rain water flows to the sides and not down the road. No doubt I have omitted some details that are important, as I am not an engineer. But the process is substantially as indicated. The plans also show the ditches on the side, which are so essential in the preservation of the roadbed; the manner in which the culverts are to be built and how both are to be paved, the culverts always and the ditches generally; the construction of the bridges, of iron or of stone, with arches, which is the general way, where the width is not too great. The contrast between the old and the new methods was strikingly presented to my mind in one case where the old bridge was still standing close by where the new bridge on the new highway crossed the same stream. The old one was still sound and served the purpose of a bridge, but it was rough and awkwardly built and badly placed. The new one was built to last forever, and just the right place was chosen for it, and without any attempt at decoration the perfection of the work made it a thing of beauty. As we passed over it, I regretted that we could not photograph them for the sake of the contrast.

In driving through the notch on which this contrast was seen, one of the most picturesque in the whole country, we saw a characteristic feature of agricultural life in the mountain parts of Norway. As I have already said, the permanent homes of the farmers are necessarily placed near the sea level. Yet at many places of greater elevation there are often quite

large tracts of comparatively level land, which, though not fit for cultivation, are covered in the summer months with a grass which makes excellent pasturage. The plats are too remote from the dwellings to drive the cows to and fro daily. Small huts are built in such places and the girls go to them and live for the month or two during which the pasturage is available, milking the cows, converting the milk into butter and cheese. These huts so used are called *saeters*. In this notch, which is perhaps ten miles long, the old road lies in the bottom of the valley, or on one side. The new road climbs up on a uniform grade, necessarily leaving the bottom of the valley in its more level spots. We passed one of these *saeters* in the valley below us, near the shore of a little pond, caused by a natural barrier in the stream flowing towards the salt-water fjord which we had left an hour before. We should hardly have distinguished the *saeter* from the rocks, with which it was surrounded, had it not been for the smoke, which was lazily curling up from a fire by its side. On the valley or mountain side, which was absolutely bare of trees, and on the old road opposite to and below us, was a procession of cows, grazing as they walked and extending a long distance up the valley. Their number attracted our attention and in answer to inquiry our driver said that they belonged to several owners, who supported the *saeters* in common. We counted over ninety cows in line and were not sure that we got them all. The only dwellings for many miles were in the hamlet we had just left.

The specifications for the construction of highways of which I have spoken, also contain full directions for the placing of the large blocks of stone, which come at regular intervals of four or five feet on that side of the road which is exposed to the danger of running off. Even these blocks, however, did not prevent the death last year of a young German naval officer, who was descending the road to Odde on the Hardanger Fjord. He was riding alone on his bicycle and is supposed to have lost control of the wheel and to have dashed into the rocky bed of the mountain torrent, flowing one or two hun-

dred feet below him. It was several days before any trace of his body was discovered. The English papers connected his disappearance with the black eye of the emperor, and more than hint that the death was a suicide, and not an accident, to avoid the scandal of an investigation.

Snow falls in the mountains in September and does not disappear from the roads till June. In fact, as the result of a slide from the mountain, on the road I have just spoken of, in the latter part of July we rode over solid snow for several rods. The time for which such of the highways as lead over the high land are available is less than half the year. By the side of these roads, when you get out of the valleys, are placed poles twenty feet high, not so far apart that one cannot be easily seen from the other. Their use is to enable the traveler to keep in the general line of the highway. It would be impossible, I am told, to keep the roads open for horses and sleds. The only traveler is the peasant on his skees. The skee is a wooden skate, such as Nansen used in his journey across Greenland, which first made him known to the world ten years ago, and also in his trip over the ice after leaving the Fram. They are strips of wood about four inches wide and six feet long, fastened to the foot in the middle. Great skill is acquired in the use of these, and they are to the Norwegian in the winter what the bicycle is to us in the summer.

I have not brought these Norwegian roads to your attention because they are better than roads in other parts of Europe, or in England or in some of our own cities, or in Massachusetts in the park system about Boston. They are not better, nor are they constructed on any different rules, except where the natural features of difficult mountain passes call for special engineering skill.

The special point of contrast is that Norway with its two million inhabitants and limited opportunities for the acquisition of wealth is now doing what England has done with its larger population, its great wealth, and it is doing it under conditions of incredibly greater difficulty. The reasons in both cases are the same,—to make life easier and more comfort-

able. England builds its roads to facilitate transportation for its own people. Norway builds its roads for the benefit of the local population, coupled with a belief founded on experience that it will bring an additional profit by attracting the summer guest, and many of the roads are built almost wholly for the latter reason.

There is a great resemblance between Norway and New Hampshire. To be sure, our state is only a miniature reproduction so far as extent of territory and population are concerned. Both countries possess mountains and lowlands and both have a large increase of summer population, to the great profit of the permanent residents of the state. When it comes to ability to meet a public or private expenditure, the advantage is wholly on our side. The Norwegian supports himself and his family only by economies and frugalities that would dismay even the careful and parsimonious Yankee. When he comes here, and there are almost as many Norwegians in the United States, including those born here of Norwegian parents, as in his fatherland, he does not go home again.

If then the Norwegian can build such roads why cannot New Hampshire? To those who use bicycles, there is no need to enlarge upon the economy in the use of good roads for business purposes. The difference between riding on a smooth, hard road and on a stony, rough, or sandy one is so great as to at once suggest what it must be to the beast of burden in the transportation of merchandise. To go up a moderate hill requires an increase of energy that is very marked. To go up a very steep one of any considerable length is impracticable. Without any regard to the selfish demands of the bicycler for a good road for his own use, the advent of the wheel is a great educator for the benefit of our dumb four-footed servants as well as for the material profit of their owners.

We have in this state no such difficulties to overcome as in Norway. Rarely ever among our mountains would the building of a highway on a grade require any very marked prolongations of the distance. The old carriage road up Mt.

Washington from the Glen House was only about twice the air line.

Our summer travel is a large and important feature in the business of the state. If you can induce each visitor to remain twice as long as he now does, or if you can bring in an additional number, you increase the profitable business of the state, securing a home market for all farm products. Good and attractive roads for walking, driving, and bicycling will contribute more than many are aware of to this result.

We spend money enough on highways, but do we always spend it judiciously? We are attempting to build macadam roads. Do we secure the best results? So far as I have observed we want to produce the most show for our expenditure, and do not lay good foundations which are out of sight and have no apparent influence on the immediate result. On the ultimate result such neglect counts for a great deal. It is better to build a mile a year as it should be built, than to build two miles so that it will have to be done all over at the end of five years.

Then again one secret of having good roads is in the constant repair. Nowhere is it more evident that a stitch in time saves nine than in the supervision of a well-built highway. By a little attention, the addition of proper material at the proper time in the proper manner, a road once properly built is always good.

We cannot have such main arteries as we need in New Hampshire by independent action by towns on our present system. There must be some comprehensive plan prepared looking to several years of continued execution. It may or may not be well to have a state appropriation aided by local assessments. A system or standard of excellence should be adopted, with variations suited to the local conditions. Local jealousies must be disregarded, as the work is for the common benefit of all, even if some sections will inevitably be more benefited than others.

The work has been going on in Norway on an organized plan for about fifty years, but it is only for forty that it has been

conducted on any large scale. Since that time, about $15,000,000 have been expended on the state roads, besides the local contributions. It is now possible to travel through the greater part of the country and to visit the most attractive scenery without leaving the smooth, solid road. The annual appropriation is still about $500,000. Not one dollar of this is expended except on roads that are built up to the established standard. What is done is sure to be well done.

We in New Hampshire are not so far advanced in the pursuit of knowledge that we may not learn from the experience of others. Many of our roads are now fairly good roads. If they were as good in all parts of the state as some of them are in this part of Rockingham county, the expense of completing them would be comparatively small. But, as a whole, we lack system in the expenditure of our highway money. It is, I think, the general belief that the abolition of the highway districts has helped us greatly. There is still much to be done. Our College of Agriculture and Mechanic Arts is doing what it can to diffuse a knowledge of good road building, and, to that institution, and to the aid which the members of the grange are in a position to give, we must all look for the bringing our, at least, main highways up to as high a standard as is demanded by true economy.

Adjourned.

FORESTRY.

BY HON. JOHN D. LYMAN, EXETER.

Forestry is tree culture. Practical forestry is the growing of trees as a crop, as practical farming is the growing of farm crops. Trees are plants, and crops of them can be as easily grown as crops of such plants as corn and grass, only it takes more time. Trees are hardier plants than those cultivated by the farmer; require less care, and that only in the leisure time of winter; will thrive without fertilizers on the poorest lands, and instead of impoverishing them like other crops,

greatly enrich them, and are not only freer from disease and have less enemies than other crops, but are frost proof and can withstand greater floods and severer droughts, and when growing are among the most beautiful objects in nature, and when grown are not only the most valuable of crops but cheaply harvested when people have the most leisure and can do little else. Of what other crop can so much be said ? But this is not all, for the forest in many instances is a shelter and wind break of much value, and many people insist that it has not only a rain-producing power, but that it is potential in preventing the streams from drying up or overflowing their banks. I have very little faith in forests as regulators of rain and rivers. But I have omitted one very important item, that is the ante-harvests before the forest reaches its maturity. Certain fruit trees have at the same time blossoms, green fruit, and ripe fruit. Beginning with seedlings of white pines, for instance, you will want the young trees as near together as we plant hills of corn. I plant white pine seed in hills four feet apart each way, making 2,722 hills to the acre. I would not care were the hills even closer. This closeness is to prevent bushy trees with large, low limbs and knotty lumber when sawed. As it takes the white pine some four years to get fairly started as a rapid grower, these trees may be some ten years old before they will need thinning, but care must be taken not to let them become crowded and consequently stunted. It takes too long for a stunted tree to become thrifty. As you thin carefully prune the dry limbs, and in some instances a few green limbs from the trees you intend to have grow into mill logs. Prune at each thinning or a little oftener. I think by the time the pine is three or four inches in diameter twenty feet from the ground, there should be no limbs upon it within twenty feet of the ground. The limbs should be taken off at various times, beginning early. It is evident when such a tree is grown and sawed its lumber will be perfectly clear up twenty feet, with the exception of knots not much larger than a pipe stem, and those only within one and a half or two inches of the heart. A neighboring car-

penter has just shown me very sappy but clear white pine boards, for which he paid forty dollars a thousand, and equally good boards, excepting the knots, for which he paid fifteen or sixteen dollars. Standing in the tree the lumber of these boards was worth respectively about thirty-five dollars and ten dollars a thousand, if pretty near market. Various experiments in pruning convince me that it will not cost over one and one half cents to prune a young pine twenty feet. Please figure it yourselves and see what a day's work is worth pruning little white pines. Suppose a man prunes only seventy-five trees a day (though he will perhaps more than double that number), and has when grown seventy-five butt logs, twenty feet long, making only 250 feet to the log, worth $35 per thousand on the stump, or $8.75 per log instead of $2.50 per log if knotty. There is no trouble whatever in growing one hundred such trees on an acre of poor land, much of which can be bought for about one dollar per acre.

But the other item to which I refer is the great amount of stakes, fence poles, shingle stuff, boxboard lumber, and timber, which the 2,622 pines cut out at various times in properly thinning an acre, which you start in hills four feet apart, will make. Think of the hoops, posts, wood, and timber in thinning white oaks. These thinnings are of much greater value than almost any acre of uncared for forest which you can find in our state. You begin to harvest these thinnings in a comparatively few years after planting your seed, acorns, or nuts. Such a forest, as my neighbor said of his religion, "Pays as it goes." Now if your young pines or other trees of the timber species come up thick at about the same time, and are left unthinned, they will almost smother and stunt each other, and at sixty or seventy years of age, instead of making five hundred feet or more to the tree, will be mere fence poles, shingle stuff, and the like. Trees grow in proportion to their live tops. They feed mostly from the air through their leaves. Thin often, but not too much at once. This last fall I thinned out and pruned some 10,000 young white pines in Waterford, Maine, upon the estate of Dr. Warren.

Pasture or bush pines, ten or a dozen feet high, I pruned about five feet, and would have one row of limbs taken off about once in two years till there are no limbs within twenty feet of the ground. From the thick pines, which I intend to grow for mill logs, I did not hesitate to remove all the dead limbs, and frequently wished there were more live limbs to leave. Now no one need say that this is all very well in theory, but is not practical. I know that it is practical. I have demonstrated it in practice. You are more sure of growing a crop of clear butt logs by following the above simple directions than you are of getting a good crop of corn when planting under favorable conditions. There are probably some 20,000 groves of young pines in this state which should be attended to this winter, and each of which would pay ten dollars a day or much more for each day's work properly expended upon it. A traveling evangelist of forestry to lecture in our towns and go to the forests with the owners and show them just how to fix their young pines, spruces, oaks, and other trees, and how to gather and plant tree seed would be of immense value to the state at a very trifling expense.

PAPERS READ AT INSTITUTES.

CONVENTIONAL, FRAUDULENT, AND ACCIDENTAL ADULTERATIONS IN FOOD STUFFS, MEDICINES, AND ARTICLES OF WEAR.

PROF. JOHN D. QUACKENBOS, A. M., M. D., NEW YORK.

Adulteration implies the debasement of a pure article by the admixture of something inferior in quality and value, whether innocent or dangerous. A large proportion of adulterations are commercial frauds. Those usually encountered in trade have in view the reduction of food materials with inert substances in order to increase their bulk, and thus insure more money for a less quantity of the genuine article. Hence the great mass of adulterants are seldom in any other respect injurious than that they interfere with the processes of digestion and assimilation, or diminish the nutritive value of food stuffs. Some, however, are positively prejudicial to health; as, the arsenic in wall papers and wearing apparel, the poisonous pigments like chrome yellow that give color to confectionery, the copper used for the greening of pickles and canned peas, the tin dissolved off cans by the acid of contained grapes, the lead mixed with cheap snuff, which I have seen induce severe attacks of lead palsy, and the salicylic acid employed as a preservative in catsups, fruit syrups, and 50 per cent of all canned goods manufactured in the United States. Commercial temptations have increased to such an extent that falsifications of food and drink are the rule. Indeed, matters have reached such a pass that an honest dealer can hardly compete successfully with a dishonest one. The question is one of pure profit and loss; the excuse advanced by dishonest traders when detected being that they are obliged to resort to adulteration by the popular demand for cheap articles—people will not pay the price of unadulterated goods. Moreover, dealers claim that their sophistications are either harmless or constitute a positive improvement, as where chiccory is added to

poor coffee, or boric acid as a preservative to milk, salt fish, and meat extracts intended for the use of invalids. It is my purpose to ask your attention in this address to the adulteration of such articles of food and drink as are most exposed to falsification; and I shall discuss, in passing, the inferior quality of drugs contained in many patent nostrums, and the great wrong done to our people by the false and sensational representations of those who advertise and peddle them.

One of the most glaring and reprehensible cases of adulteration, and one which I think especially calls for repressive legislation, is the addition of preservatives to canned goods, jellies and jams, cider and cheap clarets, milk, unfermented grape juice, etc. The preservatives in common use are: Salicylic, benzoic, and boric acids; the sulphites, the fluorides, and borax. It is true that the occasional use of these substances in small quantities is not injurious to health; but their continuous use in small quantities *is*. Borax and boric acid in repeated doses liquefy the blood and act as poisons. Benzoic acid induces gastric catarrh. Salicylic acid is an irritant poison; plants watered with a solution of it wither, in large doses it produces vomiting, delirium, acute nephritis; it is eliminated by the kidneys, and physicians are today inclined to believe that the enormous consumption of this preservative with beer, cider, canned foods, etc., is to be considered in connection with the increasing prevalence of Bright's disease in the United States. All these preservatives are hostile to the lower forms of plant life. They prevent the growth of micro-organisms, and thus interfere with decomposition in the food that contains them. In like manner, they check the development of digestive ferments, and thus tend to diminish the digestibility of the food in which they occur. You may be sure that whatever destroys the protoplasm of bacteria must produce some deleterious effect on human protoplasm; and this is the reason why all these antiseptics interfere with natural digestion. Bear in mind this physiological truism: Whatever drug, antiseptic, or disinfectant impedes fermentation, also cripples

digestion, which is itself in a great degree a process of fermentation. The habitual use of foods containing antiseptics will inevitably result in stomachic and intestinal derangements. We cannot with impunity continuously ingest with our food substances different from the vegetable and animal products which since the creation of human beings have constituted the nutriment of mankind. If the Lord had intended us to assimilate salicylic acid and borax, they would be found among the constituents of our natural foods and the proximate principles of our bodies. Further, the use of these preservatives is not only an adulteration, but it covers up the results of unskilled and uncleanly manufacture and market preparation. Good milk, sweet butter, sound beer, pure wine, can be taken care of and sold without the addition of antiseptics—have been for centuries—until (to quote Professor Cornwall of Princeton University) "Sham science came in and taught the careless and dirty producer how to evade the natural punishment of filth and mismanagement."

It is easier and cheaper to adulterate with salicylic acid than to be clean. Many brewers save the expense of washing their bottles by adding salicylic acid to the beer. Think of what you may be drinking with your beer! Think of the various poisons and unwholesome solutions that may be kept in emptied beer bottles before they are returned to the breweries. I have known bottled beer to be mixed generously with spirits of turpentine. I have seen black roaches poured from a bottle with the porter. Manufacturers who fill empty bottles without properly cleansing them are taking risks out of harmony with a Christian regard for human life. The chances are that brewers who adulterate with salicylic acid, boric acid, or the fluorides, are supplying the saloons with a drink which, if not so treated, would have decomposed and become putrid long before it was offered for sale. When it is noticed that a beer or a wine is undergoing a degeneration that will soon render it unfit for market, the practice is to add preservatives, which are of the devil devised, to make unwholesome articles saleable. This is the story of the outrage in a nutshell.

So it is with milk. Are you aware what unscrupulous milk dealers are in the habit of doing? They skim off a part of the cream, and the next day sell as new milk this partially skimmed milk, appropriately treated with boric acid to increase its keeping quality, and robbed of its tell-tale bluish tint by the addition of carotin and caramel. Do you want such milk for your babes—such stale milk, such masked milk? The use of boric acid, seven grains to the pint, to prevent the changes milk undergoes in hot weather, is an every day cause of summer diarrheas. Antiseptics in milk arrest the souring—which is nature's danger signal. Stop souring, which the addition of water hastens, and you cut away the red flag of peril, at the same time that you reduce the nutritive value of this most important food. Of course, in case of milk, the great adulterant is water. One hundred and twenty million quarts of milk are annually brought into New York city, and these the board of health recently discovered to be intentionally diluted with forty million quarts of water. If the water added be impure, has received sewage contamination, for instance, pathogenic germs may find their way into the milk and give rise to epidemics of typhoid, scarlet fever, tuberculosis, etc. The numerous cases of typhoid fever at Stamford, Conn., in 1895 and 1896, to which I referred in my address last summer, were directly traced to milk supplied by a farmer who had the disease in his family, and who washed the milk pans with water from a polluted well. The addition of water, containing, as it usually does, very large numbers of bacteria, must and does influence the keeping properties of milk. Bacteria are found to swarm in healthy milk immediately after it is drawn from the udder of the cow; and milk is considered pure when fifteen drops of it contain no more than one hundred thousand specimens of these microscopic plants. Just before souring fifteen drops of milk contain five hundred millions of bacteria, representing forty or fifty different varieties. To such milk infection, cholera infantum and the summer diarrhea of children are believed by some authorities to be largely, if not wholly, due; and here you have an explanation

of the fact that 30 per cent of all deaths occur during the first year of existence, and 60 per cent of children fed on cows' milk die before their fifth year! The presence in milk of the poisonous ptomaine known as tyrotoxicon is mostly due to carelessness in handling and transporting, like exposure in a filthy room, or the placing of warm milk from the cow in closed cans, thus preventing the dissipation of heat, and inducing an unnatural fermentation. Most cases of acute milk poisoning, accompanied with vomiting and purging, are caused by tyrotoxicon. The same alkaloid is responsible for the severe sickness we occasionally hear of as suddenly following indulgence in cheese or ice cream. Ice cream is often stiffened with gelatine; and when the gelatine used is in a state of incipient decomposition, and the ice cream is allowed to melt, and is then refrozen on the following day, as is done in many bakeries, an opportunity is given to the bacteria to revive and multiply.

Now in regard to the dangers of canned foods, 65 per cent of which are found to be in some way adulterated. The most important sophistication is the addition of the preservative salicylic acid, the poisonous nature of which has already been discussed. Of the effects of this drug on the human system, the canners are presumably ignorant. Its administration should always be under the control of medical men, and not left to the discretion of unscrupulous manufacturers, who know nothing about the action of medicine, and care nothing so long as they can get your dollar. Fancy a doctor prescribing some article of food or drink for a convalescent with delicate digestive organs, and innocently administering with the nourishment this wholesale destroyer of digestion. Wine containing four and one half grains of salicylic acid to the pint (it requires only ten grains to the gallon to prevent the growth of ferments) has already been condemned in New York City in five thousand gallon lots; and the next step about to be taken by our health department is an attack upon the proprietors of canned and other foods, who kill the spores contained therein by the use of this preservative, instead of by the harmless and

rational process of pasteurization. We need a law requiring that on each can of preserved food the character and amount of preservative used should be stamped. If in the face of this announcement the consumer sees fit to purchase, the responsibility rests with him. A dealer in food has no moral right to add or subtract anything without due notice to the consumer; and he should be compelled by law to give such notice —to fly the danger signal. Articles of food above all things should be as represented. The moral I would draw is this: Buy the highest priced canned goods. Apparent high price means that the canning is properly done. If properly done, there is no need of salicylic acid.

Special danger is to be apprehended from the use of canned asparagus, whose acid corrodes and blackens the sides of the can. Canned asparagus has been found to contain a sufficiently large per cent of sulphurous acid to render its moderate use poisonous. Traces of tin have been detected in canned tomatoes; and the sulphuric acid which is sometimes mixed with canned corn to bleach it, attacks and dissolves the tin walls of the can. When I tell you that one hundred million cans of corn are put up annually in the United States, and that a large fraction of this corn is bleached with sulphuric acid and then canned with salicylic acid, you may perhaps form an estimate of the amount of injury done to the public by the sale of such adulterated corn as pure. But I am under obligation to say to you, that very little sickness is after all caused by the presence of metallic substances in canned foods; but that a great deal of sickness *is* due to the carelessness of consumers, who, after opening a can, allow the contents to remain in the can instead of removing them to a covered glass dish. An invasion of bacteria takes place at once, and toxines are quickly developed. Again, the contents of the can may be spoiled—this is an accident that may happen to the most conscientious packer—and it certainly deserves the same treatment as in the case of spoiled uncanned food—throw the contents of the can aside.

In the limited time at my disposal, it will be impossible for me to acquaint you with the almost endless variety of food adulterations detected by reputable chemists in the past few years. That true food, coffee, is subject to sophistications whose name is legion—chiccory, caramel, and roasted grains of all kinds, dandelion, turnip seeds, peas, pea-hulls, beans, venetian red, brick-dust, straw, sticks, clay, and bake-house sweepings. Beware of "prepared" coffees, as they are likely to contain over 50 per cent of rye and peas. One specimen examined by the board of health contained no coffee whatever. Ground coffee is naturally most exposed to falsification; and yet a *coffee bean* has been put upon the market composed of a wheat mash colored with red oxide of iron. Tea is adulterated with spent tea leaves, and with rose, willow, elm, and poplar leaves; with prussian blue, gypsum, and sand. Cream of tartar, with sulphate of lime and cornstarch. All spices with wheat, nut-shells, corn, rice, and sawdust. Cloves have been examined that were 70 per cent dirt and nut-shells; and cayenne pepper that was 90 per cent cocoanut shells and corn. Butter is oleomargarine (not injurious to health, but simply a fraud if sold as butter). Lard has become beef fat and cottonseed oil. Glucose masquerades as honey. So-called distilled waters, which ought to be absolutely pure, are found on analysis to contain from one to one hundred and twenty parts of solid matters per hundred thousand. The water of Lake Sunapee in this state was analyzed last August by Dr. Lederle, the chemist of the New York board of health, and found to contain only 2 3-10 parts of mineral matter to the hundred thousand, that is 1 34-100 grains to the gallon—an almost unequalled purity. The water of Lake Sunapee is thus nearly three times as pure as the far-famed Poland Spring water, which sells all over the country as a beverage; and twice as pure as that of Boston's boasted Brookline supply. Such water is nature's specific in lithæmia, uricacidæmia, gastric irritation, nephritis, alcoholic poisoning, and nervous depression, the latter always accompanied with dessicated nerve

organs. It is pure water that relieves, not the mineral constituents of the water; and it is pure water that Americans will not drink, unless it is prescribed by a physician and costs them a dollar a gallon. The people of New Hampshire have in the pure spring water of Lake Sunapee a most valuable heritage; and it is their interest to insist on its being kept free from all kinds of contamination.

Owing to the low price of flour in the United States, the adulteration of this commodity is comparatively rare, although alum is frequently added to damaged flour to arrest the decomposition of the gluten. Dr. Battershall notes that the rock and rye drops so popular among our school children of the large cities, prove to consist of a mixture of glucose, flour, and fusel oil—*fusel oil*, or amylic ether, the most hurtful ingredient of raw liquor, and the cause of the headache, foul tongue, nausea, and liver disease that accompany whiskey-swilling. Chromate of lead, salts of copper and arsenic, white zinc, and prussian blue render candy attractive to the youngsters. As to colors in other foods, the tendency is to tint everything. The colors employed may or may not be harmless. Many are added for fraudulent purposes, like the solutions of yellow coloring matter that are used in bakeries as egg substitutes, to play the role of eggs in pound and sponge cakes. Aniline dyes have largely taken the place of metallic colors, and being insoluble they are innocent.

When we come to malt and spirituous liquors, the adulterations resorted to have become notorious. The consumption is greatly in excess of the ability of the brewers and distillers to produce wholesome beverages. About thirty million barrels of malt liquors represents the yearly output of the United States. Much of this, to meet the demands of trade, is sold when new and imperfectly fermented, and a great deal of sickness is the result. Beer should be stored in cool cellars (*lager* means a storehouse) for from five to eight months before it is fit for consumption; little of the beer sold is properly aged. Besides, the beer drinker in this country has to run the gaunt-

let of various preservatives; of artificial bitters like salicine, strychnia, and aloes; of the well known excito-motor picrotoxin, the active principle of cocculus indicus, which has narcotic as well as stimulating properties, and is used to impart both bitterness and headiness; and of grains of paradise, or Malagueta peppercorns, which give a hot, strong flavor and provoke thirst, so that the more beer the consumer drinks the more he wants.

Intoxicating liquors are as liable to adulteration; but it must be conceded that it is the raw alcohol and not the admixtures that causes the chronic catarrh of the stomach, the Bright's disease, the arterio-sclerosis, the palsies and ataxias, the nervous bankruptcy, and the moral degradation of the dram drinker. *Good* rum as well as *bad* rum will gradually convert the different organs and tissues of the body into specimens of degeneration and disease. *Bad* rum is more prompt in its action, and almost all the rum that is retailed is *bad*. I have in my hand the price list of Herman Kienzler, No. 39 Dey street, New York, the notorious "compounder and rectifier's friend," the man who supplies the bar-rooms of the state with essences for manufacturing liquors, cordials, sherbets, etc. It is the practice of the liquor dealer to stock his cellar with cheap grain spirits contaminated with fusel oil, a chemical compound which has been ascertained to produce poisonous effects in a proportion fifteen times greater than ordinary ethyl alcohol, the common stimulant. He then provides himself with a full line of Kienzler's essences—brandy essence (consisting of oil of grapes, acetic ether, allspice tincture, and alcohol), rum essence (composed of butyric ether, acetic ether, vanilla tincture, essence of violets, and 90 parts alcohol), gin essence, hot drop essence, whiskey essence, etc., and in accordance with the instructions of a handbook furnished by Kienzler proceeds to make from the same barrel of crude grain spirits, by the addition of the prescribed quantity of the several essences, what he advertises over his bar as *pure* liquors. The same barrel gives birth to Bourbon, rye, wheat whiskey,

malt whiskey, Scotch and Irish whiskey, Jamaica and Medford rum, Schiedam-Schnapps and Old Tom, cherry, peach, apple, blackberry, and Cognac brandy. The cost of the amount of essence required to manufacture in this way 120 gallons of Cognac, 160 gallons of gin, 40 gallons of any kind of rum, and 160 gallons of any kind of whiskey varies from $3 to $4. Such are the cheap artificial imitations of distilled spirits, the frightful compounds of fusel oil and whiskey essence, the saloon-keeper palms off with impunity upon the habitues of his cabaret. Is it to be wondered at that the liquor seller is traditionally a rich man? Is it surprising that the saloon has become so great and arrogant a power in the land? Ladies and gentlemen, I know what is done in the saloons of New York. I have listened to the confessions and admissions of the poor bar-tenders who have lived upon the hell-broth manufactured by their principals until their spinal cords were rotten and their brains reduced to pulp. My fellow Academician, Dr. Gilman Thompson, has observed the evils of excessive indulgence in alcoholic drinks to be strikingly illustrated by its effects in case of the *very liquor dealers,* who for the sake of worldly gain are destroying the bodies and souls of their fellowmen. "The mortality among liquor sellers from various diseases, as compared with that of other men, bears the ratio of 3 to 2. When a similar comparison is made in regard to the mortality of liquor sellers from the special diseases that are caused by the consumption of alcohol, the result is still more startling—for nervous diseases, the ratio is nearly 2 to 1; for alcoholism, 5½ to 1; for liver diseases, 6 to 1."

I am advertised to say something to you in regard to adulterations in articles of wear. In this climate, it is necessary for man to protect his body from changes of temperature by appropriate covering. We cannot live in winter without imprisoning the animal heat produced in our frames by chemico-physiological processes; and in summer it is desirable to lose a portion of this heat by wearing materials that are free con-

ductors and radiators. Most important of all materials for dress, because coarse and porous enough to imprison within their interstices atmospheric air in such quantities as to make them *the best of bad conductors*—because reluctant to absorb external moisture and equally reluctant to part with it when absorbed, thus protecting the wet body from the evil effects of rapid evaporation—are the *woolen fabrics*. Indispensable during the cold of winter; invaluable during perspiration after exertion in summer, because absorbing four times as much water to the surface as either cotton or linen; the equalizer of the temperature of our bodies—the great protector against sudden chills—*flannel* in some form should be worn next to the skin the year round. From the equator to the poles, woolen garments are par excellence the best. It is well known that in the tropics those who wear flannel are singularly exempt from the malarial diseases there prevalent. Next to wool ranks *cotton*, which is generously used to *adulterate* woolen garments. Being a better conductor and absorber of moisture than wool, and, I may add, than silk, it is less safe than either. For skins too sensitive to endure flannel, cotton serves a most happy purpose—although from high temperatures it does not protect as well as *linen*, nor from low temperatures as well as *wool*. Finally linen—the *best of all conductors* and hence the coolest of fabrics; the most rapid of all absorbers of moisture and hence never free from its cold, clammy feel—should not be worn next to the skin, as its property of rapidly cooling the body in perspiration is a dangerous one. It has been found by experiment that a tin pail of boiling water, covered with woolen cloth, takes much longer to cool than if wrapped in cotton or linen. Knit undergarments are now made for the most part of *cotton*, but they are conventionally called *flannels*. It is highly probable that more than one half of all the *knit* shirts and drawers made in this country are manufactured *exclusively* from cotton, although advertised as all *wool*. Hence when we wish to be sure of *honest wool* we are obliged to buy high priced importations. Some fabrics are likely to contain

antimony, arsenic, or lead as mordants; and these poisons act as irritants to the skin. It is always wise, therefore, to wash out purchased goods before wearing them. There are also on record cases of poisoning from hat bands, colored either with arsenic or antimony. As underwear is generally uncolored, the danger from dyes in wearing apparel is reduced to a question of stockings and socks. Black stockings are sometimes a tissue of chromic acid: red of arsenious acid and antimony. The New York board of health has destroyed whole invoices of stockings containing these poisons.

The partiality of Americans for patent medicines is too well known to need any confirmatory statements from me. One reason of the extensive use of patent medicines is the prevalence of dyspepsia, induced by the consumption of unwholesome adulterated foods and drinks, and accentuated by symptoms that suggest various other ailments, for which proprietary drugs are advertised as specifics. Another reason is to be found in the ignorance and credulity of the modern public, who are ready to believe every tale of miraculous cure reported and illustrated in the daily press. The greater the improbability, the more readily do the gulls seize and swallow it—faith cures, mind cures, gold and other drink habit cures, Christian Science cures, consumption cures, cancer pastes and plasters, and a thousand embrocations, elixirs, salves, syrups, and potions. Each numbers its disappointed victims by the thousand, and experience seems to be a poor teacher, so far as these fad-chasing sufferers are concerned. Note this atrocious advertisement of a so-called Samaritan Nervine: "A bad temper can be treated just as successfully with a dose of medicine as a cough or a headache. Dishonesty in a servant need not be punished by discharging him; you have only to give him some Samaritan Nervine. If your son will not study his lessons, do not send him to bed early, or threaten him with more severe correction, but give him Dr. Murchison's Samaritan Nervine for one week. A miserly father refused to sanction the attentions of a poor but respectable young man to his

daughter. The loving damsel surreptitiously inserted a few drops of the Samaritan Nervine into her father's coffee, and within a fortnight the stern old gentleman not only acquiesced in the lovers' marriage, but gave the bride a handsome dowry." This article is put up in 5-ounce bottles at $1.50 each. It can be manufactured for less than 15 cents, and is composed of bromide of potash, sugar, and water. (Oleson.)

A patent medicine is a medicine whose composition is concealed in order that it may be advertised as a marvelous specific. It is usually composed of some worthless simple other than represented, or contains substances dangerous to health and life. It is usually got up by some man or woman with little or no pretence to medical education, who flourishes like a parasite on a deluded public, and trifles with human life, recklessly indifferent to consequences. Many of these persons are criminally responsible for obtaining money under false pretences, their goods not being as represented, as well as for fraudulently administering drugs that undermine the bodily and mental health of those who buy—and all this under the pious pretence of renovating an exhausted body and restoring the powers of a jaded brain.

The patent medicine business is a big business, and like a great octopus extends its sucker-covered arms into the very vitals of trade. The capital behind it makes it difficult to combat. Half the country newspapers would be forced into bankruptcy were it not for the lying advertisements of the proprietors of patent medicines. The country druggists would have to put out their lamps, or resort to the selling of liquors and cigars; the country stores would be compelled to scrape to pay their expenses; the printing establishments would see the traditional wolf stretched out on their door mats, if it were not for the sagwas, vegetable compounds, nervines, and golden remedies, which are advertised "to bring men and women out of torture worse than death." The object of these advertisements, placards, and pictures, is to induce this torture *by impressing thought-forms on the thought-machines or brains of*

credulous persons—who are physically well and among whom disease increases in the same ratio as patent medicine advertisements. The diseased thoughts, and thoughts of disease, suggested thereby, are brought to a focus in the material bodily organs, and imaginary sickness, even more prolific of discomfort and pain than actual organic disease, is the result. The charlatan has attained his object—he has produced a *state of mind in harmony with his false representations*—and fattens thenceforth on the distresses induced thereby in his victims. The bold, offensive, and terrifying advertisements of the day represent a systematized attempt on the part of a legion of charlatans to *create disease* for the benefit of their pockets. The mind tends to become like whatever it dwells upon. "To look on noble forms," wrote Tennyson, "*makes noble*, through the sensuous organism, that which is higher"—so to become conversant with the circulars, advertisements, hand-bills, and disgusting portraitures, of these unprincipled nostrum-vendors, tends to a permanent state of nervous and mental depression. Constant thought of any condition soon produces a *cortex habit*, and *induces the condition*; and this is the foulest imaginable prostitution of the noblest profession known to man. In a work on medicine, published at Rome two centuries before the Christian era, Cato the censor exclaimed against the Greek physicians who were being attracted to Italy. For 500 years, he said, the people had led healthy and happy lives, in blissful ignorance of the medical faculty, but let these Greek doctors come into Rome and there will soon be diseases enough to treat. History proved the truth of the wise old man's foresight.

The patent medicine business is based on a lie. *There is no such thing as a specific for any disease.* Every scientific physician knows that *routinism is the bane of therapeutics.* To prescribe a uniform dose of any preparation for mankind at large is to ignore the fact that all animals present in their physiological functions variations on the same type; and while the same drug would produce the same *class* of action in any two

human beings if adjusted to individual peculiarities, in *many cases* an excessive, in others a deficient or negative result would follow. Besides this, the medicine itself may be improper; for the laity are generally unable correctly to diagnose their condition, and the taking of an unsuitable medicine may effect no inconsiderable amount of constitutional injury. All cases should be treated individually, according to their special requirements. The man, therefore, who tells you he has a *specific*, that is, a drug which will invariably cure consumption, cancer, dyspepsia, etc., is an unscrupulous falsifier. Nor are these preparations what they purport to be. A once used oats essence, for instance, advertised as a nerve tonic containing neither alcohol, nor any other harmful ingredient, and recommended to cure the alcohol habit, contains 35 per cent of alcohol, with two grains of morphine to the bottle. So-called *tonics*, many of them warranted to reform struggling inebriates, contain from 11 to 41 per cent of alcohol. Face-bleaches, freckle lotions, and moth eradicators, are usually corrosive sublimate. The sarsaparillas are, as a rule, iodide of potash solutions. Certain obesity pills have been found by analysis to be nothing but sugar, which increases fat; and pastiles, advertised to cure all female complaints, are tablets of hardened flour paste. A tasteless cod liver oil discovered by the chemist of the New York board of health in the hands of his young niece, and analyzed by him, was ascertained to be 22 per cent alcohol. Be on your guard against these lies, for they are apt to be forerunners of robbery—that is, the prices charged for valuseless simples are enormous. Face washes, by way of example, selling from one to two dollars a bottle, as if there were some mystery involved in their preparation, are alcohol and citric acid, with a little sulphur and chalk in suspension—worth five to ten cents a bottle. It is extremely questionable whether there is any therapeutic virtue in sarsaparilla; but if you have faith in the efficiency of smilax as a blood purifier, why not purchase the officinal compound fluid extract of sarsaparilla rather than give a dollar for three cents worth of iodide of

potash or iodide of soda. Forty samples of sarsaparilla that were examined by the Massachusetts board of health in 1892 were all found to contain a soluble iodide. A popular Catarrh Cure, which retails for $1.50 a box, has been found to be composed entirely of soda costing less than 1-10 of one cent for the contents of the box. I need not multiply these cases. You will encounter hundreds of similar exposures in Dr. Oleson's "Secret Nostrums and Systems of Medicine," just published at 35 Clark street, Chicago.

Tens of thousands of persons worn out by the constant battle with poisonous medicines and sophisticated foods, at the great centers of adulteration, and the struggle to digest marble dust, coal tars, fusel oil, alum and metallic salts, are seeking out the New Hampshire farms today in order to get back to nature and to natural food. It seems as if here alone linger a few customs of the old and happy and healthy days of home-grown, home-made, home-worn things—the good old days when mother carded and took regular exercises at the spinning wheel, and manufactured the wool of the farm sheep into cloth that did not wear out in *one* season: when grandmother knitted the scarfs and mittens and socks with no admixture of cotton; and sister made up the homespun and linsey-woolsey into coats and trousers; and father boiled down maple sap into sugar, and ground the sweet home-raised wheat into nutritious flour, innocent of alum and plaster of paris; and corncakes and brown bread were baked in the old brick ovens (for white bread was reserved for the dyspeptic minister); and the butter was hung in pails down in the well to keep it sweet; and the pewter can of cider passed from mouth to mouth at the apple-paring bees and quilting parties; and the first gentlemen of the village served wholesome cake and pure domestic wine at the spinning bees in the town hall or at the parsonage; when of an evening the family sat around the huge fireplaces with rude scripture tiles and shiny brass andirons, and the girls played the spinet and harpsichord, and drew their partners by lot at the dances, and the suppers consisted of innocent rusks and

tea. These were the days when every farm was self-supporting; produced all that was consumed and worn, except salt, spices, tea, coffee, and millinery, and perhaps the shoes that were made by some enterprising neighbor on rainy days from native hides prepared at the village tannery. These were the days of health and vigor; the days of sound teeth, and pink cheeks, and plump forms, and rural beauty. These were the days when women were not afraid to breast a storm, or thought they must send for a doctor if they did an honest day's work. These were the days when doctors and physic were not required unless some one broke a leg or dislocated a shoulder, or when a child was born or the smallpox broke out—and then the nurse was of far more value. When there were no country stores, as schools for scandal and dispensers of high priced patented medicines; when the doctor's saddle-bag was the only drug shop, and that contained only simple remedies; when folks were content with what the Lord had given them, and neighbors were bound together by episodes of mutual friendship and dependence. Oh, for a taste again of the hearty, wholesome food, the happy days and restful nights of the olden time, when people took things easy and were strangers to the rush, unrest, emulation, and artificiality of modern life. It is to experience *this taste* that so many citizens of other states come to New Hampshire today, to share for a vacation season his home with the farmer. And certainly it is to the farmer's interest to maintain the reputation of the Granite State for honest, well-cooked, digestible foods and comfortable, peaceful home life. My friends, you are well aware that the future of this state is not agriculture, I mean, that New Hampshire may not figure in the galaxy of states as an agricultural star. Her future is to become the great summer resort of the United States—and all that she can do to render attractive her highways, to protect her unequalled scenery from vandalism, to keep her glorious forests *standing*, to preserve the waters of her streams and lakes at a level consistent with health and consonant with beauty, to maintain the purity of her

water and air, to limit the prevalence of disease by wise health regulations, to stock her covers with game and her waters with fish—all the money expended in this way will be returned a hundred fold in the rise of property values; in the extension of railroad systems, in the prosperity of her farmers and farm boarding houses, and through them in the prosperity of all classes and trades from which they derive their supplies; and in the increasing popularity of her great mountain and beach resorts, as centers of health and relaxation.

BUYING A FERTILIZER.

PROF. F. W. MORSE, DURHAM, N. H.

"Which fertilizer is the best?" is a question often asked of anybody connected with the inspection of fertilizers, and the answer must as often be given, "Nobody can tell which is the best; but some are much better than others." Since there are over one hundred different brands for sale in this state, it is hoped that a few facts about mixed fertilizers and their relations to crops will be helpful to those farmers who use such goods, and they are far more numerous than those who buy chemicals and mix them at home.

Judging from the multiplication of low-priced brands of fertilizers, I think that it is safe to assume that many farmers select their season's supply of fertilizer on the basis of price, and that comparatively few give more than a passing glance at the guaranteed composition. If one depends on the price as a guide, it should be borne in mind that cheap goods mean small proportions of active plant-food and large proportions of inactive waste material that cost as much to mix, put into bags, and transport as the best grades. It should be remembered that several brands selling for the same price per ton may vary widely in their composition, just as several hotels may charge a uniform price for meals, but furnish very different bills of fare.

Some farmers take pains to ascertain how closely the analytical valuation of a fertilizer agrees with its retail price. Chemists' valuations of fertilizers are as unsafe grounds for a choice as the selling prices, because they are calculated from wholesale prices of standard materials at large trade centers, and do not include freight, labor of mixing, bags, agents' fees, and interest; besides, there is the same chance for variations in composition which do not affect the valuation. There is usually a difference of from $10 to $12 per ton between valuation and selling price of reliable goods. When the figures

come much nearer together either the manufacturer is attempting to cut out rival companies, or else is using inferior material of a kind that is not evident to the chemist; a trick that is possible.

A variation of five tenths of 1 per cent of nitrogen in a fertilizer will change its valuation $1.40 per ton, while 1 per cent of available phosphoric acid means a change of $1.15, and 1 per cent of potash is equivalent to 90 cents. Fertilizers may therefore be more widely varied in phosphoric acid and potash than in nitrogen without changing the price, because potash can be raised and phosphoric acid lowered, or the other way, since their cost is nearly alike. On the other hand, as the valuation decreases, the percentage of nitrogen becomes less, and potash is also often diminished. Consequently in a low-priced fertilizer one may purchase as much phosphoric acid and perhaps potash per ton, as in a high-priced kind; but seldom enough nitrogen for ones needs. These points are clearly shown in the table which includes the guaranteed composition of several prominent fertilizers sold this year, together with their valuation and selling prices per ton.

COMPOSITION, VALUATION, AND SELLING PRICE.

	Nitrogen.	Available phos. acid.	Insoluble phos. acid.	Potash.	Valuation per ton.	Selling price per ton.
1	3.75	8.0	1.0	6.0	$25.50	$36.00
2	3.30	6.0	1.0	10.0	25.40	36.00
3	2.50	8.0	2.0	4.0	20.60	32.00
4	2.50	9.0	3.0	2.0	20.35	32.00
5	2.00	8.0	1.0	3.0	18.60	30.00
6	2.00	9 0	1.0	1.5	18.40	30.00
7	1.00	10.0	2.0	1.5	16.45	28.00
8	1.00	8.0	1.0	4.0	16.00	28.00
9	1.00	4.0	1.0	8 0	15.00	26.00
10	.....	11.0	1.5	2.0	15.05	26.00

Some farmers doubtless place dependence on the name of a fertilizer in judging whether it will be adapted to corn or potatoes or grass; but a comparison of a number of special fertilizers will show wonderfully conflicting ideas among the man-

ufacturers, if the composition of their goods is any indication of their views with regard to the particular needs of different crops. B's corn fertilizer is closely similar to J's complete potato manure, and moreover J sells two more potato fertilizers wholly unlike each other and the first named. C puts out a special corn fertilizer and a special potato fertilizer that are exactly alike except in their name, and E's two brands are so nearly alike that one crop would receive only the equivalent of ten pounds of muriate of potash per acre more than the other, when they are applied at the customary rate. For seeding down, one manufacturer allows much potash and another only a little. A third considers nitrogen unnecessary for grass and oats.

SPECIAL FERTILIZERS.

Name.	Nitrogen.	Available phos. acid.	Insoluble phos. acid.	Potash.
B's Corn	3.00	7.0	3.0	6.00
J's Complete Potato Manure	3.73	8.0	1.0	6.00
J's Potato Fertilizer	2.06	9.0	2.0	3.25
J's Potato Phosphate	2.50	6.0	2.0	5.00
C's Corn	1.20	9.0	2.0	1.85
C's Potato	1.20	9.0	2.0	1.85
E's Potato	3.70	7.0	2.0	8.50
E's Corn	3.70	7.0	2.5	9.50
B's Seeding down	2.25	6.0	4.0	10.00
J's Seeding down	2.50	7.0	5.0	2.00
G's Grass and Oats		11.0	1.0	2.00

While special fertilizers are contradictory in their composition, there is a fairly uniform agreement among staple crops in their relative proportions of nitrogen, phosphoric acid, and potash contained in their tissues when the entire plant is considered. The actual percentages may vary considerably, but in general all crops contain much less phosphoric acid than potash and nitrogen. Roots, tubers, leafy vegetables, and fruits contain somewhat more potash than nitrogen, and grasses and cereals more nitrogen than potash.

Stable manure has much the same composition as the grasses; but if from highly fed animals, may contain even a higher proportion of nitrogen.

MANURIAL CONSTITUENTS OF SOME STAPLE CROPS.

Crop.	Nitrogen.	Phos acid.	Potash.
Timothy hay	1.26	.53	.90
Redtop hay	1.15	.36	1.02
Corn with ears, dry	1.76	.54	.89
Red clover hay	2.07	.38	2.20
White clover hay	2 75	.52	1.81
Oats, ripening, dry	2.00	.49	1.70
Potatoes	.21	.07	.29
Beets	.24	.09	.44
Turnips	.18	.10	.39
Cabbage	.38	.17	.43
Asparagus	.36	.17	.48
Lettuce	.23	.07	.37
Tomatoes, vines	.32	.07	.50
Tomatoes, fruit	.16	.05	.27

Mixed fertilizers are in striking contrast to these proportions, since they invariably contain a higher percentage of phosphoric acid than of nitrogen and usually higher than potash.

There are very practical reasons for this disagreement between the composition of chemical fertilizers, even special ones, and the crops for which they are intended. The first special fertilizers for certain crops were placed on the market about twenty-five years ago. The attempt was made to follow the principle of putting into the soil as much as the crop will remove, and the special manures were mixed on the basis of analyses of the different kinds of plants, and consequently contained higher proportions of nitrogen and potash than of phosphoric acid. At the same time there were on the market two or three brands of bone superphosphate combined with a little ammonia and potash. Because of their high percentage of nitrogen the special manures were very costly as compared with the superphosphates, and field trials showed them to be of but little more value as crop producers. After two years' trial, the composition of these manures was radically changed and their composition became but little different from the superphosphates with which they had been competing. The main distinction was a little higher proportion of nitrogen for corn manure, and of potash for potato and vegetable manure, than were contained in the general fertilizer.

The failure of special manures, compounded closely according to the composition of plants, was because they contained nitrogen and potash in highly soluble forms, that with the nitrogen and potash naturally in the soil provided more than the plant needed, and the nitrogen especially would be wasted by leaching, whereas the nitrogen and potash in stable manure is more slowly available and consequently more economical to apply in large quantities out of proportion to the crop's immediate needs.

Close observations of carefully planned field experiments and successful methods of practice have disclosed the following facts about plant growth and its relation to the soil and to fertilizers that have an important bearing on the selection of a fertilizer for various crops. In a state of nature, plants live and reproduce their kind, and a system of checks and balances keeps them within well-defined bounds with respect to number, size and form. In cultivating plants we endeavor either to produce an abnormal development of a plant's size or form or to increase the number of plants on a given area. With crops that require a long growing season and possess an extensive root system, for example the grasses and winter grain, and perhaps corn, one may and should make the most of the more slowly available natural manures and the latent fertility of the soil. On the other hand, for crops that we wish to force, which usually have a restricted root surface, as well as a limited growing period, we must apply large quantities of quickly available plant food, so that none of the plant's energy is wasted in developing rootlets to seek for the compounds essential to its growth. This means heavy applications of well-rotted stable manure, or soluble nitrates, superphosphates, and potash salts. It is almost invariably necessary to add much more actual plant food to the soil in such cases than will be taken up by the plants. In order to gain an early harvest, one must sacrifice manure, just as in mechanics a gain in velocity means a loss in power.

In general farming, fertilizers should be selected with reference to the period of growth of the crop, and the most economical use of the natural resources of the farm, including both the farm manures and the soil constituents. A rotation of both crops and fertilizers is necessary for the best results.

The following scheme, which follows fairly closely the practice of some good farmers, may be taken as a method to economize fertility:

A piece of worn-out grass land is plowed in the fall. By spring the turf will be rotted and furnish considerable nitrogen, which is slowly nitrified. Our New Hampshire soils are naturally rather scantily furnished with phosphates; but many contain large amounts of potash, which slowly weathers to a soluble condition. For a crop of corn we may safely reckon on a large portion of its nitrogen being taken from the vegetable matter in the soil and some of its potash from the same source. Experience has shown that 600 to 800 pounds per acre of a fertilizer containing from 3 to 3.5 per cent of nitrogen, 8 to 10 per cent of available phosphoric acid, and 6 to 8 per cent of potash, will produce a good yield. The next year, another application of the same fertilizer will produce a good crop of early potatoes, to be succeeded by a catch-crop of barley. By this time the soils nitrogen will have been heavily drawn on, without materially affecting its phosphoric acid and potash. A liberal application of coarse stable manure and wood ashes in the fall, after the barley has been cut, will renew the vegetable nitrogen, and help in the decomposition of soil potash. The following spring the land may be seeded to clover, timothy, and redtop.

I believe that the rotation of fertilizers and the introduction of lime or ashes into the course at intervals is an important feature of farm practice, in order to make the most of one's natural resources.

The continuous application of manure from grain-fed animals must either result in an enormous accumulation of nitro-

gen in the soil or a loss of the element, and experiments have shown conclusively that it is lost, consequently it should be our aim to get all the soil-nitrogen possible into crops. On the other hand, the repeated application of mixed fertilizers as they are now prepared, and must be prepared, will cause an exhaustion of soil-nitrogen beyond the limit necessary to fully supplement the other constituents of the fertilizer in plant production.

Such a fertilizer as I have mentioned cannot be bought for $25 per ton. The chemicals themselves will cost about $30 per ton before mixing. But it is better balanced, in my opinion, than the low-priced brands, for the reasons already mentioned.

I do not think any farmer can profitably use several years in succession any one of the cheap brands. An alternation of a phosphoric acid brand with a potash brand, and their use in conjunction with stable manure to furnish nitrogen, may be satisfactory in yield of crop; but I cannot see how the purchaser can get as much real value for his money as in the best materials.

There are exceptional cases where cheap fertilizers have done as well as high-grade fertilizers; but in such cases the farmer should study the combination of conditions which made such a result possible. I must also emphasize the fact that a high-priced fertilizer may be ill-balanced in composition. I consider such to be the case when a fertilizer contains a larger amount of potash than of phosphoric acid, so far as our Durham soils are concerned, at least.

In conclusion, this paper has been limited to a discussion of ready-mixed fertilizers because the position of the Experiment Station is well known on the subject of home-mixed fertilizers, and this matter is rarely treated except in the bulletins devoted to fertilizer analyses.

HOT PLOWSHARES.

PROF. I. P. ROBERTS, ITHACA, N. Y.

The rapid development of science in agriculture during the last decade has naturally led our thoughts away from a consideration of the subject of improved farm practices. The problem of potato culture as affected by the scab, beetles, bugs, early and late blight, has been studied scientifically by a score of experiment stations. In most cases, the causes of defoliation of the potato have been discovered and remedies found, yet the yield of potatoes per acre has not been increased perceptibly.

The science of churning, of ripening cream, of curing cheese, and the identification of germs, both beneficial and injurious, have all received studied scientific treatment, yet tons of so-called butter, little better than axle grease, still finds its way to the village and city markets. Not long since I received a letter from one of my students, which contained the following query: "What is the value of cheese as a fertilizer? I can purchase it at $5 per ton in the New York market." Cheese which should have sold, if it had been properly manufactured, at from $140 to $160 per ton was actually purchased, in considerable quantities, at one quarter of a cent per pound, composted with barn manures and used for fertilizing the land, and it is probable that the last transaction was profitable, for a ton of the cheese contained 78 pounds of nitrogen, 12 pounds of phosphoric acid, and 2½ pounds of potash, with a probable value of $11.75 per ton. But how about the profits of the persons who milked the cows and made the cheese?

Many such illustrations might be given to show how lamentably deficient in the art of husbandry many farmers are at the present time. As has been intimated, the sciences related to agriculture have been pressed upon our attention so vigorously and persistently that we have failed to emphasize the necessity of skill and judgment in the application of scientific facts to

the production of plants and animals. The fact that water moves uphill as easily as downhill, that it expands when the temperature is raised, contracts as the temperature is lowered until the water congeals, when expansion again takes place, is most interesting and valuable, but if one forgets to water the cows, then a knowledge of these facts will not fill the milk pail or the butter plate.

What is wanted more than any other one thing in agriculture at the present time is the skill necessary to carry the art of agriculture to its highest profitable limit. I trust it will not appear egotistical if I draw my illustrations from the results of improved farm practices from my own recent experiences.

For years I have been contending that, in a majority of cases, the low yields of farm crops were not due to a lack of potential plant food in the soil, but largely to crude and careless farm practices. Forty-nine soils of supposed ordinary fertility showed, when analyzed, that the eight inches of surface soil contained of potential plant food an average of 3,217 pounds of nitrogen, 3,936 pounds of phosphoric acid, 17,597 pounds of potash per acre, and this does not include the potential plant food which is contained in the stones, gravel, and sand of the land which will not pass through meshes of ½ mm. (1-50 of an inch), which by weathering and tillage slowly give up their valuable constituents. Soil which had produced three consecutive good crops of corn, oats, and potatoes without manures or fertilizers, was sifted and analyzed with the following results:

56 per cent of the soil passed through meshes of 1-18 of an inch while 42 per cent did not pass through. The soil contained, per acre, one foot deep, potential plant food as follows:

Fine soil: Nitrogen, 3,074 pounds; phosphoric acid, 3,784 pounds; potash, 12,063 pounds. Gravel: Phosphoric acid, 4,009 pounds; potash, 11,329 pounds. We have a most promising crop of potatoes now growing on this land, though no fertilizers or manures have been used, and notwithstanding the

fact that the soil is carrying but little more than half as much potential plant food as the average of the forty-nine soils referred to above. Here is a gravelly soil of moderate fertility at the beginning, cropped for four consecutive years, unaided by clovers, grasses, manures, or fertilizers, and yet it produces more than three times as much as the average yield of the same crops in New York.

What is the secret? There is none. We have simply set at work, aroused from its lethargy, that abundant, lazy, potential plant food by keeping the plowshares hot.

During the last two years, from the land described, and from that similar to it, has been realized from potatoes each year between $82 and $83 per acre, though the potatoes were all sold at the low price of 25 cents per bushel. The amount realized for the potatoes each year was double the value of the land upon which they grew, provided the land had no augmented value by reason of its juxtaposition to village or city.

I have said that our successes are due to "hot plowshares," but, associated with tillage which may be made to conserve moisture as well as set free plant food, healthy foliage must be secured. The yield of potatoes in New York this year will be low, not because of poor soil or bad seasons, but by reason of the early and late blights which have so seriously injured the foliage that early and tender varieties will produce less than a half of the average yield. The result is, potatoes are selling in our local markets in August at 75 cents per bushel.

But what about the productivity of those fields which have been kept in regular rotation and have not been used for the purpose of emphasizing the effects of tillage?

Our farm is situated on the borders of the great winter wheat district of central New York, and we have taken some pains to test varieties on a large enough scale, and under good ordinary conditions, to give results which will be valuable. Through the center of the wheat field of twelve acres, there were sowed five plats of as many varieties of about one half acre each, one of which (No. 1) was of the same variety as the

balance of the field. These plats have been threshed and the grain and straw weighed. The following table gives the names of varieties and the yield per acre of grain, straw, and chaff:

Variety.	Grain.	Straw.
Rochester Red	45.51 bushels.	3.05 tons
Johnson	46.43 "	2.59 "
Dawson's Golden Chaff	54.90 "	3.19 "
Early Genesee Giant	50.18 "	3.18 "
Ovid	43.85 "	3.04 "

Average of all, 47.68 bushels.

This year there was cut, from a field of 13.35 acres, 3.7 tons of medium clover hay per acre. It will probably shrink 10 per cent in the mow. At the present time the growth gives promise of from one to two tons per acre which may be cured as a second crop by the end of August.

The success in all these cases must be attributed to "hot plowshares," associated with other factors of production, for these fields from which the crops have been harvested were twenty years ago producing less than the average crops of the state, which are so meager as to lead one to wonder whether our country is a semi-arid waste, or whether, at the close of the nineteenth century, we bright Yankees are still practicing squaw farming.

As you know, I reside in the "Empire State," which is supposed to be the garden of the world, and yet the average production of the leading crops, according to the last census report, is as follows:

Census of 1890. Yield per acre in New York: Hay, 1.27 tons; wheat, 17.95 bushels; oats, 27.44 bushels; barley, 23.53 bushels; Indian corn, 30.63 bushels.

But "hot plowshares" are likely to burn the farmer's pocket if not associated with all or most of the other factors of success. How often do we see these "hot plowshares" burning holes into the bank account of some enthusiastic city farmer?

Many other illustrations might be given to prove that most of the land which should be devoted to tillage is not exhausted

but contains vast quantities of potential plant food which needs to be aroused from its lazy condition by the plowshares, and changed from its useless combination into life-giving grains, luscious fruits, and beautiful flowers. But tillage alone is not sufficient to double and treble the yield per acre of farm crops. Moisture in suitable abundance must be provided or the prepared food cannot be transported from the soil to and through the plant.

Irrigation in the Eastern and Middle states is impracticable on a large scale in most localities, therefore moisture for the growing crops must be secured in some other way. How? By making of the soil a reservoir for the storage of moisture. Soils which contain a reasonable amount of humus may carry 20 per cent or more of moisture and yet not contain any free water, which is so detrimental to growing plants. An acre of soil one foot deep, containing 20 per cent moisture, weighs about 1,800 tons, 360 tons of which is moisture held in the soil by capillary attraction. It is seen how readily a soil may be converted into a great storage reservoir for moisture by deep and frequent plowing and by sub-drainage. "Hot plowshares" may be used most advantageously for forming these great moisture storage receptacles. Most cultivated plants suffer nine times for moisture where they suffer once for lack of plant food in the soil. If you are not convinced of this, sub-irrigate a portion of your land by laying tiles ten inches deep between every second row in land used for the production of inter-cultured crops. Let the water in the tiles in such abundance as to supply constant moisture to the rootlets of the plants and note the increased productivity.

If, then, we can till the soil so as to absorb and hold in its pores a considerable amount of moisture and yet not be too wet, the problem of supplying moisture for the plant is measurably solved. I hold in my hand a cube, each face of which embraces four square inches, and it contains in all twenty-four inches of surface. If I dip this cube in water it will not come out dry, but a portion of moisture will adhere to the

sides. Moisture tends to form a film on all sides of soil particles whether they be round, square, or irregular in shape. If this cube be divided into eight inch cubes, it will then present forty-eight square inches of surface, or if these cubes be reduced to cubes of one half inch each, there will be ninety-six square inches of surface, and if we continue to divide until our cubes have faces of one thirty-second part of an inch, there will be 3,072 square inches of surface exposed, to which moisture may adhere. Now if these small cubes be broken down as small as are the particles of soil when under good tillage, it will be seen what vast quantities of moisture will adhere to the particles and be held there by capillary attraction. If then we break our soil into fine particles and compact them so that the interstices between the particles are not large, nor should they be, we have immensely increased the power of the soil to hold on to moisture. But this is not all, for it is not enough to store moisture in the soil by the use of "hot plowshares," it must be conserved, for if the heat of the sun and the wind rob the soil of its moisture, they indirectly rob the plant of its means of life. If, in addition to putting the soil in the best mechanical condition, we add an earth mulch of two or three inches deep on the surface, with pores so open that capillary attraction cannot lift the moisture to the surface but only to the roots of the plants, we have done much to conserve the moisture in our soil reservoir. Far more moisture escapes from the surface of badly tilled land in warm weather than is used by the plants. This escaped moisture does no good. That held in the soil is precious and extremely useful.

In so brief a paper it is impossible to treat fully the subject of soil physics, but from your own experience you will readily see how necessary it is to store moisture in the spring-time, when it is abundant, and to conserve it by better methods than are now practiced during the dry days of midsummer.

What I have said should not lead the farmer to believe that by improved methods he can make the steep, stony hillsides

profitably productive. These abandoned and semi-abandoned tracts of land should never have been cleared. It is a great mistake to spend one's efforts upon land which is not naturally worth our consideration. We were in too great a hurry to destroy the magnificent forests which, if they had been preserved, would now be of ten times the value of the land before Nature's modes of action had finished the work of producing a soft, deep, mellow surface soil. We have been in too great haste. Why not withdraw from these steep hillsides, let Nature again clothe her nakedness and hide our shame, and leave Nature to complete her work and leave the land for the use of future generations?

All of the crops now raised in the United States could well be secured from a third of the area now used to produce them. Why then cultivate three acres at great expense and labor to secure the products of what one acre of our better lands is easily capable of growing with but a little added labor or expense?

The unprofitable agriculture is not due to our stars but to ourselves. "Sixteen to one" and low and high tariffs may have something to do with our prosperity, of that I may not speak here and now, but the lack of prosperity which should come to the farmer is largely due to the fact that we are not farming well and that we are farming two acres of land where we should farm one, and that we are cultivating much land which is naturally so ill adapted to the American farmer that every dollar put into this land and every day's work expended upon it result in a loss. Why then keep this bright American boy chasing up and down the corn rows which are millions of miles long in order to get billions of bushels of corn, one half of which is secured at a loss? Why not cut off the poor end of the corn row, or rather cut it off in the middle? Or, if you please, cut it off one third of the way from the top end and after the boy has thoroughly cultivated this short row let him go fishing if you can find nothing better for him to do.

I have given you the yield of wheat on a portion of our land. You may remember that it was upwards of fifty bushels per acre. True, this year the wheat is slightly better than that of last year, when the estimate of the Agricultural Department is, for New York, 18 bushels per acre in 1890, and 15 bushels in 1896.

How can you hope to keep a bright boy on the farm raising 15 bushels of wheat per acre, 30 bushels of oats, 23 of barley, and 26 of corn? If the boy is worth anything he will flee the farm, he will turn to almost anything and become almost anything in order to escape the depressing influence which comes from low yields of farm products, and the low remuneration and meager profits which result therefrom. Scientific and practical agriculture have come to stay. This land, the fairest part of the globe, will not be depopulated or fail of a remunerative harvest if the schoolmaster is alert and does his duty.

The need of the day, as I see it, is for a more rational education of our children—an education which shall not only teach them to love Nature in her varied moods, but one which shall teach them of the practical affairs, that is, shall teach them sciences which, when properly applied, will give promise of as much remuneration for effort on the farm as in any other line of activity. We are not on the eve of a revolution, but the work of evolution has already begun. We are not to study the dead languages less but the living things more. We are not to raise more products but better ones. We are not to raise billions of bushels of grain simply for the sake of bragging of our vast crop, but each for himself is to raise fewer acres unless he is already farming these acres at a liberal profit, abandoning the poorer land unworthy of tillage, if need be, and doubling the yield of small areas which should be brought under the highest profitable tillage now known. And it is not enough to speak of these things and to show by facts and figures that more than one half of the land is farmed at a loss. The American farmer must have nerve and the courage to say once for all,—unless the cow or the acre or the orchard brings a good profit, a liberal profit, then I will cease to till the acre, to pro-

tect the fruit, or to milk the cow. I will not be a "dog in the manger," I will step down and out and let some man who has more experience and more skill occupy these acres, till them as they were meant to be tilled, and preserve their fertility and productive power for the generations yet unborn.

HOME GROWN FEEDS FOR DAIRY COWS.

HON. B. WALKER MCKEAN, AUGUSTA, ME.

I believe that the production of a larger proportion of the food for our cows is one of the most important problems which now confronts our dairymen.

It is only within a few years, comparatively, that we began to purchase commercial feeding stuffs from the West and the South, yet in this brief time the trade has reached immense proportions, so much so that many of us have come to put a large dependence upon them, nearly leaving the finer home grown feeds out of our calculation. This idea has been carried so far that in many instances the proper handling and feeding of some of our coarser and most easily cultivated crops have not been given the attention their importance warrants.

We have known Maine dairymen to feed but small amounts of hay to their cows, making purchased grains a very large part of the daily ration, feeding from four to six quarts of cottonseed meal, with other grain, per cow every day when fresh in milk. This appears to me to be unwise from an economical standpoint as well as from the point of healthfulness.

We need not dwell at any great length at this time upon the different classes of feeds; suffice it to say that all dairymen are now fully aware of the necessity of feeding according to certain rules, and that one great class of foods, albuminoids, are used by the animal to build lean meat, bone, blood, and incidentally, milk, while the other great class, the carbohydrates, so called because they are composed of carbon and hydrogen, are used to make fat, to maintain heat, and produce energy.

Of the best combination of these foods we have learned much in late years from the work of the experiment stations in this country and abroad, and much from our most careful feeders, but still in my opinion there is much more to be learned. I

believe that an animal will largely adapt itself to conditions, and that if certain feeds are not at hand it will find a way to supply their place by the use of others if they are to be had in abundance.

The question of comparative cost is one of supreme importance, and must be first considered in formulating any ration. Farmers should never lose sight of the fact that there may be a utility ration as well as a balanced ration, and that local conditions and local crops may largely govern the choice. When we have fully made up our minds in regard to these questions we shall have solved one of the most difficult problems in determining the kinds and conditions of our home grown foods.

It occurs to me that we ought to class hay, including clover, as of the first and greatest importance, from the fact that it thrives over a larger area and is cultivated upon more farms than other foods, and forms by far the larger part of our ration. The dairyman who grows his own foods to the best advantage must have few old grass fields. He must work as near the plow as possible. He must seek variety by growing his coarser foods as close to the fertilizer as possible. These conditions, fully observed, will give him in his hay crop alone a far larger amount of albuminoids, and place his home grown foods upon a plane nearer that which he is striving for, a balanced ration. Hay, grown in this way, cut early and well cured, forms one of the best feeds for general uses.

We are all familiar with the value of pasture grass. We know that when animals have an abundance of this food without undue exertion to obtain it, they thrive as upon no other feed. This pasture grass is an entirely different thing, however, from the hard, woody hay that is too often served to our cows during the long months of winter. Woody fibre, so essential in the growth of the plant, is not a part of its food value, and the more it increases the less that value. In addition to this the starch or carbonaceous part of the plant increases more than the albuminoids, and pushes it further from the balanced food it is as grass. This difficulty can be avoided largely by early cutting and by feeding in variety.

On land naturally adapted to grass I think the farmer should depend upon the hay crop to a considerable extent for his coarse feed. This land should be made to produce from two to two and one half tons per acre, and if clover is largely grown the quantity and value may be materially increased, giving a food with a digestion coefficient of nearly 60 per cent, and a total digestible dry matter of 2,000 pounds per acre in round numbers. Another item to be mentioned in favor of this early cut hay is the ease and cheapness with which it can be grown. The expense of labor is a very important factor in the success or failure of our farm operations in New England, today. High prices for labor and low prices for farm products have an unfortunate tendency to bring our balance on the wrong side of the ledger.

Next in importance to the hay crop is corn, a plant admirably adapted to much of the soil in New England, particularly those soils which are not suited to the growing of grass. This fact places it in the front rank as a home grown food product. I think I am safe in saying that soils which will produce but a very small quantity of food nutrients in the hay crop will yield, under proper cultivation, as high as 3,500 pounds of digestible dry matter in corn. This large amount of food will, under those circumstances, well repay for the extra amount of labor required in its cultivation.

I believe that a few figures here in relation to the relative value of the different parts of the corn plant may be of value. For years we have reckoned the value of our home grown corn crop, from a comparison of the amount of ears with the corn in our markets. This is an error, and a wrong to the plant, as the most of its food value for stock feeding is in the fodder after the ears have been removed. The crop can be harvested at such a time and in such a manner that this may be nearly all saved, and still secure the ears in good condition. Careful investigations, together with quite elaborate feeding experiments, have proved that in a field of corn, the entire crop yielding 3,172 pounds of dry matter, there were 1,530 pounds in the ears and 1,642 pounds in the stalks, a balance, as will be seen,

of 112 pounds in favor of the stalks, which will fall but little below the ears in percentage of digestibility.

This investigation, carried a little further, showed that of these 1,642 pounds, 197 pounds were in the blades; 450 pounds in the tops: 426 pounds in the husks, 569 pounds in the butts. This shows conclusively the wisdom of harvesting and storing the entire plant in such a manner that it will be readily eaten by stock. I would harvest when the most of the ears were fairly glazed, and, if not necessary, would not bind or shock, but put in the silo at once, ears and all, preferring to cut it in. If it is desired to feed the ears to animals which will not be fed the ensilage, they can be broken from the stalks, and placed in small piles to dry before husking. I have seen ears cured in this way this season, fit for seed.

The silo has long since passed its experimental stage; it has become a part of the outfit of every dairy farm with soil adapted to the growing of corn.

It does not improve the plant, it adds nothing to its value, it *does* take something from it, but it forms the best and most economical method of storing corn, from the standpoint of labor and of loss of food nutrients, as well as the advantage of the more palatable condition of the fodder. I believe the time is not far distant when we shall see the silo used for the storing of other home grown crops, and they will be of such a nature as shall tend to balance the ration as it is taken from the silo.

The corn stover, if the ears are removed, may be made a very valuable addition to our coarse fodders, if well cured and judiciously fed. Unless in undue proportion to the other fodders, it will be readily eaten by stock if fed in connection with other coarse feeds, a little of each, every day, studying the appetites of the animals and feeding somewhat accordingly. If a very large amount is to be fed it will be found profitable to cut or shred it, particularly if the ears are allowed to remain on the fodder.

Nearly all of the straws may be fed in limited quantities to good advantage. I doubt if any farmer can afford to sell good oat, barley, or wheat straw for less than $8 per ton, reckoned

on the basis of its food value alone, when fed in connection with other coarse feeds. In our practice, we have found the feeding of oats, oats and peas, and oats, wheat, and peas, unthreshed, advantageous. When cut sufficiently green to prevent them from shattering, we have been able to get as good returns in growth and milk, fed as about 50 per cent of the entire ration, as from an equal amount of our best hay. Our farm horses have been fed no hay since our grain was cut, and they are doing finely on oat and pea hay, with a light grain ration.

Another class of home grown foods which is not receiving the attention from our dairymen it ought is the vegetables. On farms adapted to their growth, which may not be naturally adapted to corn, they should form an important factor in the dietary of the animals. They can be grown cheaply, in large quantities on a small area, and although somewhat light in their content of dry matter, what they do contain is so highly digestible, and they are so thoroughly enjoyed by the animals, that in actual use, they appear to furnish more food than their analysis would warrant us in expecting from them. The vegetable which gives the highest amount of dry matter is the potato, and as it is adapted to so varied conditions and grows naturally over so large an area, it ranks first in importance. A yield of 200 bushels per acre will give, in round numbers, 2,000 pounds of digestible dry matter. While this is not so very far above the yield in hay under favorable conditions, it is of sufficient importance to warrant their growth, both for their food value and for the purpose of introducing a hoed crop in the rotation on soils unadapted to the growing of corn.

Beets, turnips, mangolds, cabbages come in place, and for the reason that they may be grown in such large quantities assume considerable importance in our home grown foods. Even with a silo and quite a large acreage of corn, I find it profitable to grow a small quantity of mangolds each year, which, with our small potatoes, are fed to our cows and young stock through the winter to good advantage.

People are apt to attribute certain results which may be found in the product to foods, particularly to vegetables, when in reality the main trouble, if there is a trouble, comes from their improper handling and not from the foods themselves. Too many of the flavors noticed in milk or butter come from the conditions in which the animals are kept and not through the digestive tracts from the foods themselves. Sudden changes from a dry to a succulent food, feeding it in large quantities, will throw the animal out of condition and affect the product. This is as true of pasture grasses as of ensilage or roots. If the air of the cow stable is loaded with the fumes of ensilage, vegetables, or other substances, the animals being obliged to breathe it continually, the milk pails allowed to stand in the stable and the milk being drawn carelessly, and allowed to stand in the same conditions, we must expect imperfections in the product, but should not blame the cow or the food, our own carelessness and indifference is responsible for the whole trouble. One of the worst experiences of this kind I ever had came from a load of phosphate which I thoughtlessly placed in a close room adjoining the cow stable. Let us get rid of the idea that the cow needs only certain classes of foods to ensure her health and the quality of her product. Let us learn that any food which she eats readily may be fed to our own advantage and for the benefit of the cow, and her product.

There is a tendency to blame the cow for all imperfections in her product. Does a peculiar or unfavorable condition exist, she put it there! Does an epidemic of disease break out, it came from the milk, and the cow is responsible for it. Or if there is no disease there may be, and therefore she should be tabooed, and put under the closest supervision, directed by those whose interests are not with her but against her. It all reminds me of the anecdote of the man who, when he was leaving home in the morning, said to his boy: "Kim, if you don't hoe those potatoes today, I will whip you when I get home; but, say, Kim, I know you won't do it, so come here, and I will whip you now and have it done with."

I tell you I believe that when trouble does come, in ninety-nine cases out of every hundred the cow is the only innocent party in the transaction. She is carelessly and ignorantly handled and fed by her owner, her products are handled by dirty or diseased persons after they leave the farm, or are too often tampered with by interested parties who strive to increase their profits by extending the amount of their goods from unknown sources without consulting the cow or her owner.

But enough of this. Let us consider, briefly, another class of coarse foods, the clovers, peas, and beans.

I am a believer in this class of crops, particularly the clovers and peas. They afford us the means for growing more albuminoids, they help us in variety and may be grown in rotation, taking but little plant food from our soil, in fact, they may be made the means of improving our soil. They are as valuable for summer feeding as for winter feeding, and if fed as quite a part of the ration, in summer, particularly, they may take the place of quite a proportion of the purchased grain. If fed when in their best condition, green and succulent, they will be eaten with such a relish that in connection with pasture grasses there will be but little need of any grain. This is a decided gain, and is one of the points where the dairymen of the future must economize.

I believe we are buying too much of our albuminoids or protein. This class of foods is the most expensive of any, and for that reason should be grown as largely as possible. The more of it we have in our legumes, our clovers and peas, the less we shall have to depend upon the South and West for it. These feeds, when fed from the mow or silo, will form a large and valuable part of our ration.

There are other leguminous crops which may be grown in more or less abundance. Some of our more progressive dairymen are experimenting with the soy bean, the vetch, and the sunflower. I have received very favorable reports from the vetch and sunflower. The vetch is sown broadcast with oats and is considered superior to peas. The sunflower is grown in

drills either alone or with corn, and put in the silo in about one fifth part, with corn. One farmer in Hancock county reports excellent results in milk and butter from the second season's feeding.

I have said nothing about the production of the finer feeds, the grains, upon our farms, and I believe that, except in rare instances, in sections remote from large markets, the land can be more profitably used by devoting it to some special crop to be sold for cash, and thus get money to purchase most of the grain used. There are places in Maine, however, and there may be in this state, where home grown grains should form nearly or quite all of the ration.

With present prices for the glutens, cottonseed meal, and bran there are many articles which can be grown and exchanged for them to good advantage. The chief point which I wish to impress upon our farmers is the folly of depending too largely upon these purchased grains, neglecting those foods which may be grown cheaply to take their places.

The ideal dairy farm of today is quite fully self-supporting in the production of cattle foods. It affords such a variety of crops that all may be consumed to good advantage. It is thereby made capable of producing at so low a cost that its products are put upon the market at a fair margin of profit at all times.

DISCUSSION.

J. L. Gerrish: I want to ask Brother McKean whether he considers it better for the average farmer to plant common field corn and treat it as he has designated, rather than the ensilage varieties which are put into the silo at a different stage of their growth?

Ans. I would answer that question by saying that in every instance I would advise the growing of as large a variety of corn as will grow in your locality. I would discourage the growing of a large amount of ensilage corn. Some of our farmers are planting sweet corn, taking off the ears and getting market value for them, and getting fodder for the silo.

J. L. Gerrish: I would like to ask the gentleman if he has had any experience in the growing of vetches that would be valuable to us.

Ans. I have had no personal experience in growing vetches. There is one of our large farmers, who lives about nine miles from Augusta, who has sown vetches for two years, in connection with his oats, instead of peas. I am unable to give you the amount of seed he uses per acre, but he prefers them to peas. They give him a very large amount of feed, and he thinks the feed is superior in every way to peas for him to grow. The character of the soil is light clay loam. The climate there would be about the same as it is here in this vicinity. I would have no hesitation, from what I have observed under the conditions in which they are grown there, together with some sections in which they are grown in Aroostook county by the Swedes, to recommend butter farmers in this state to try them for one year. I have no doubt you will be pleased with them.

Mr. Sanders: You tell us of the importance of feeding protein. Can you tell us in which brand of gluten meal we can buy our protein the cheapest; in other words, which is the best brand of gluten meal?

Ans. Pound for pound, I consider the Chicago gluten superior to any other. I think all analyses will prove that, as well as the experience of our practical feeders. As for its being cheaper, that depends on the price you can buy it for in the market.

C. H. Waterhouse: The gentleman sitting by me says he bought a ton of gluten meal today, and it is the Buffalo gluten. I said: "You have made a mistake; you can buy your protein cheaper in the Chicago gluten."

Ans. Unless there is too large a margin in the price, he certainly would buy it cheaper in Chicago gluten. The Chicago gluten analyzes to be richer in protein than any other brand. Sometimes our farmers have got confused, and have failed to distinguish the difference between gluten meals and gluten feeds. Now a gluten feed is quite low in protein. It

consists of the hull and of other waste materials of which the gluten meal is entirely free, consequently in buying you want to look out and not buy gluten feed in the market, and think you are buying gluten meal.

C. H. Waterhouse: Do you believe that in one gluten meal we have about 26 per cent protein, and in another 36 per cent?

Ans. I don't think we have a gluten meal as high as 36 per cent. That is about as high as cottonseed. There is but little difference between the best brands of gluten meal and cottonseed.

C. H. Waterhouse: My experience is, the Chicago gluten for protein and price.

Ans. No doubt about it, in my judgment.

J. L. Gerrish: What is the effect upon the butter?

Ans. It is supposed to make a soft butter. If fed in large quantities, especially if the cows are not accustomed to it, I have no doubt that that condition would be found in the products; but if the cows are gradually fed upon it, increasing from a very small quantity up, in connection with other feeds, I think you would have no trouble at all with a soft butter. Mr. Waterhouse ought to know more about that than any other man in the room.

Mr. Waterhouse: Gluten meal induces soft butter. If you take a half dozen pieces of butter of the same temperature, and drop a pencil on the butter, it will penetrate farther into the gluten fed butter than it will the cottonseed. Cottonseed has a tendency to make hard butter, a crumbly butter. I feed my cows equal parts, by weight, of Chicago gluten and cottonseed.

Mr. McKean: I think there has been a tendency on the part of many of our dairymen in the vicinity around Portland to feed too large quantities of cottonseed meal. I doubt the wisdom of feeding cottonseed meal in so large quantities as some have fed it. I have no doubt that fed at the rate of two quarts at the outside it may be found very valuable indeed as a protein food. I wish our people would get away from the idea as far as possible of the necessity of buying large quan-

tities of protein in our markets. I think that is one of the errors we are led into by our scientific workers. It always has been very much easier for some of us to go to the market and buy a bag than to put the labor into the production of the food, but it is a question we have got to meet face to face in the future, because it is coming to be a kind of survival of the fittest, and the man who can produce a pound of butter the cheapest is going to be the winner in the end, and he has got to produce that butter on home grown foods.

Mr. Sanders: If you were going to buy a bran, which would you select?

Ans. I would like a coarse, flaky bran, and I would like just a trace of flour. I wouldn't like a bran which shows just the hull and nothing else. I would be afraid too much of the kernel had been removed.

Mr. Waterhouse: Will you give us the composition of what they call "mixed feeds?"

Ans. No, sir; and I don't think anybody else can. That is an unknown quantity.

H. O. Hadley: I would like to ask the gentleman what he considers the difference in cash value between these foods. He says buy the Chicago if it doesn't cost too much more. If Buffalo gluten is worth twelve or thirteen dollars, and Chicago eighteen, would he buy Chicago?

Ans. Assuming that both are good of their kind, I doubt if there would be a difference between the two brands of five dollars. Assuming that they are both good quality, I should buy the Buffalo.

G. M. Putnam: In my section more cream gluten is fed than any other.

Ans. I should consider the cream gluten better than the Buffalo gluten; that is, richer in protein.

J. W. Sanders: In reckoning the actual cost of the gluten and the cottonseed meal, have you ever taken into account the fertilizing elements that yet remain to the farmer after the cow has got through with it?

Ans. Yes, indeed. It is a fact that all foods rich in protein have a higher content in manurial value. A ton of corn meal fed to an animal will leave but very little comparatively in manurial value when returned to the soil. A ton of cottonseed meal will give the most of any concentrated feed we buy, and the glutens will come next to it. These questions, of course, come in as secondary considerations. I doubt if we can any of us afford to feed our animals with an idea to the fertilizing of the soil. I think we should feed our animals as cheaply and economically as we can for good results, and let the fertilizing material take care of itself. Of course, the value of the food as a protein food also gives it a larger value as a fertilizing food when returned to the soil in every instance; there is no question about that. Just how much it would be, of course depends entirely, or largely, upon the way it is handled. There is a large value in fertilizing contents in a ton of cottonseed meal to put it right in the soil, but from the fact that it is not complete manure, it is not wise for us to buy it to put on the land and for no other purpose.

POULTRY CULTURE.

SAMUEL CUSHMAN, PAWTUCKET, R. I.

Isn't it a rather insignificant matter to bring up before this State Board of Agriculture meeting, the annual meeting of the year—the matter of the poultry industry? Is it, or is it not? Now, lest some one here thinks it is a rather insignificant matter, I would present a few facts. The "American Agriculturist" estimates that the number of fowls in the United States in 1896 was 383,000,000; the number of dozens of eggs produced 1,141,000,000; and the total value $342,000,000; and they say the permanent investment represented by the poultry industry will amount to $240,000,000. Not long since, the "Rural New Yorker" looked the matter up and stated that the egg and poultry products of the country exceeded all the gold and all the silver produced in this country, and gave some figures. They estimated that the poultry earnings were $290,000,000, while the total of all the pensions paid out was only $139,000,000; the total of all the school expenditures, $178,000,000; the total interest on all the mortgages, $76,000,000; the value of the swine of the country, $186,000,000; the potato crop, $78,000,000; tobacco crop, $35,000,000; cotton crop, $259,000,000; oat crop, $163,000,000; the wheat crop that is making the farmers rich, and the important crop, supposedly, of the country, was that year, 1896, $237,000,000; while the earnings of the poultry were $290,000,000. Now few persons, unless they study the subject up, appreciate the importance of the poultry products of this country. Last night Major Alvord, of the United States Department of Agriculture, told us of the work that the government is doing in opening up a market in foreign countries for American butter. This country produces more butter than it uses, and is, I believe, exporting butter. This country imports eggs, millions of dollars' worth every year. The state of Massachusetts does not produce one tenth of the eggs used in the state. The state of

Rhode Island produces still less in proportion to what is used. This country imports eggs every year. This year it has imported less than for many years, and I believe a few shipments have been made to England. There is a great foreign market for eggs, as well as a great foreign market for butter, or for wheat, or for any of the products of this country. Great Britain pays out $50,000 every day for eggs raised outside of the country; and eggs from France reach English cities in better condition than those produced in the interior, while eggs from Australia have been quoted in London as high as fresh eggs from France. In 1894, Germany's egg imports exceeded her exports by 78,000 tons, and over $14,000,000 were paid out by her for foreign eggs in one year. Canada produces her own supply of eggs, and exports eggs to England. The United States produces wheat and sends it to Europe, and competes with that from South America, Russia, and India; let us see what it costs to ship wheat compared with eggs. While the transportation of one dollar's worth of potatoes one thousand miles costs us forty cents, and one dollar's worth of wheat twenty cents, one dollar's worth of eggs may be shipped the same distance for eight cents. The people of this country, to hold their own, must produce and import food in a refined and more valuable form, instead of as rough, crude, and bulky products. Now why shouldn't we turn the corn and wheat of this country into something that we shouldn't have to pay so much freight on to get it to Europe? There is no reason whatever. How do we get the best profit from cows? One of the necessities to succeed is to have good stock, have the right kind of breed. Of the 383,000,000 fowls in this country, probably not 10 per cent of them are improved poultry. They are inferior; they are not properly cared for. The people who keep them do not manage them in an up-to-date way. They could be improved, and no doubt the product could be increased from 25 to 50 per cent. Major Alvord told us last year of the butter shows in Denmark; the competition, the prices offered, the example, the lesson everybody can learn by visiting these shows. If they go there and see

the finest butter, they realize why they are not getting the best price for butter. If every purchaser could go to New York or Boston markets and look at what brings there the gilt-edged price, he would very quickly see he had got to do something better. If every grange in the country would not only hold such butter shows as you have downstairs, but egg shows, and dressed poultry shows, it would have a vast influence on the production of poultry. All the people need is to be interested and made to realize how poor their product is compared with the best.

My subject this morning is, Should farmers keep pure bred fowls, and adopt the latest methods of poultry management? Should *all* farmers keep pure bred fowls, and *all* farmers adopt the latest methods of poultry management? I would say this paper is prepared for people who keep fowls and produce eggs and poultry for food,—the farmer and the village poultry keeper. I will not pay very much attention to the breeding of fancy fowls for sale and for exhibition. The few can do that, and some of them can make fortunes, but the majority of the people of this country would fail if they undertook to do it. There are various opinions as to whether every one who keeps poultry for food should keep pure bred fowls. I think we can learn something about the question if we look about among cattle breeders and producers of butter and milk. We do find pure breeds quite often, producing very gilt-edged products, and the breeders of those cattle are doing a great work for the country by distributing the males about the country to breed from. Perhaps they make money by breeding pure breeds, the product may be very fine, but I think you will find in the working dairies of the country that grades take a very important place, and that the majority who really are business producers get the benefit of pure breeds, but they do not keep pure breeds. I believe every farmer should get the benefit of pure breeds, but I do not believe it is necessary for him to go into keeping nothing but pure breeds. It is claimed that the best pure breeds will give the most profit. In some cases it may be so, but I believe there are many cases where

the first cross or high grade will do still better. In breeding for shows and breeding to standard, the breeder has a beauty standard as well as a utility standard, and sometimes, if it is a question of one or the other, if it is a point to be decided on, he will in selecting give preference to beauty points, because he wants to enter them at an exhibit. In sending birds about to exhibitions they are taxed very much. If they go to three or four shows in cold weather, and stay in warm and drafty halls, and are fed too much, they get all jaded out after a time, especially the nervous breeds. The vigorous class can stand it perhaps without making very much difference, but the Leghorns and Hamburgs, and even the Wyandottes, deteriorate if they are shown many seasons and many times in a season. I believe fanciers are doing a great work for this country. They are bringing up the poultry business. The practical breeders would never take the pains to breed fine fowls and do the work fanciers do, they have a different motive. Fanciers, to sell their fowls, exhibit and compete with each other, and these fowls on account of their beauty have been bought and kept for beauty. What we admire and what we love we care for better, and take more pains to feed them properly. They study the laws of breeding more thoroughly, and in this way the breeding of fancy fowls has gradually extended and developed the practical poultry industry.

A question that a great many are at a loss to decide, a question that is much discussed, is, which is the best breed? If I am going into the poultry business what shall I keep? I would say that there is no best breed. The best breed for one man is not the best breed for another man. The best breed for one kind of management or one kind of production is not the best breed for another kind of production. The poultry industry now is divided up into specialties. A man to do the best work cannot produce all the poultry products. He must aim at one certain thing. Men do not produce butter, cheese, and milk all in the same dairy usually. They make a specialty of butter or cream or of milk. It is the same in the poultry

business, only there are more branches, more departments than in the dairy business, I should judge. I think all who have kept poultry and sold poultry on the markets are convinced that there is great need of improvement, and many are asking earnestly and seeking for advice. The advice given conflicts very much. One man says one thing, another says another. One man settles down to one sort of product, one sort of management. He says that is the way to do it. Another man has another plan, and says that is the way. One man has a breed he wants to sell. He thinks it is the best breed. The show-bird breeders say, our birds are just as good for practical purposes as anything else, and much more beautiful. The utility breeder says, I don't send my birds to shows; I don't pick them out just for beauty points; I breed them for eggs, for poultry, and I can sell them for less; they are hardier and more profitable. One man, who breeds fowls that are very good for flesh production and not very good layers, says, the main thing is to sell fowls on the market that bring the highest price, therefore the flesh-producing breed is the one. Others who keep birds that lay white eggs say, our eggs bring the best price in the New York markets. Others say, the brown eggs bring the most in the East, and our fowls lay brown eggs. The beginner is all at sea. Each one has to go to work and experiment and find out for himself. He must experiment on his own hook. It is a great waste of time and expense. Here in New England many thousands of dollars are wasted the first year or two that beginners take up the business. They have to try several seasons before they know just what they want to keep. Meanwhile the breeders who sell these birds make money out of them. It seems to me that we can all understand why experiments along this line should be conducted carefully and made public to save all this waste of expense, waste of time. The men who write about poultry, most of them, write to sell their stock. That is their object. The men who do not sell fancy poultry, or poultry for breeding, do not often say much about it. They are busy putting stock on the market, getting cash for it; they have very little to say

about the best breeds, the best management. The disinterested men say very little about it. We hear from the seller of pure breeds about the good points of the breeds, but very little is said about the bad points, the outs. There are a great many breeds that the practical poultry raiser thinks are worthless and doesn't keep; he discards them. When the fashions change, when the poultry industry departs in other directions, these very breeds the fanciers have preserved and kept may be the ones that the practical raiser will be very glad to secure and use in his production. Thus the fancier preserves all this material just from a love of the beauty of the different breeds, and the practical raiser benefits by it. I will attempt to give some of the qualities of the different breeds. I don't believe there is a man living who could describe all the different breeds and give the correct impression how they would do under different management and in the different climates of this United States. I will not attempt to describe half a dozen of the best-known breeds and get it just right. The Light Brahmas are a noble breed: they are very hardy; they are beautiful; they are quiet; they do well in the small yards; they lay large, brown eggs, but they get too fat very easily if they are overfed, and they are rather sluggish if given their full liberty on the farm. For their hardiness they are one of the most valuable breeds, and their large brown eggs in winter are very desirable, very welcome. But the time is coming, in my opinion, when the Light Brahmas will not be the most popular breed. They are very valuable for crossing, and give hardiness to some tenderer breeds that are greater egg producers. Cochins are still hardier than Brahmas. They do even better in confinement than Brahmas. They do not fat up quite so easily. They are not so fleshy and so good for market poultry, but they are rather better layers in cold weather, and they are the finest sitters in existence. Any one who has used a pure Cochin, or half-blood Cochin, for incubating purposes will apreciate them, and find they are better than anything else under the sun. The Leghorns we all know are great layers, layers of white eggs. They lay better in sum-

mer than in winter, and have to be pretty well protected in winter. When you dress them they are rather thin and angular. The only time a Leghorn really appears to advantage is when it weighs a pound and a half to two pounds. Then they may be dressed and sold as broilers and bring a good price and stand well with other breeds, but later in life they are not desirable market fowls. The Leghorns today I think are smaller than when I was interested in them years ago. They lay perhaps a few more eggs, but the eggs are smaller and the birds smaller. I would like to see a White Leghorn as large as a Black Minorca. The Black Minorca lays more large eggs than any other breed. They are white eggs, and for the New York market they bring the most. They have black legs, white flesh, and black plumage, therefore their pinfeathers show in the young birds, and if you undertake to sell a lot of them on the market, and with the modern market which calls for yellow legs and yellow skin, you will fare pretty hard. If you want to keep them for home consumption they are all right. The Minorca is one of the best breeds for the small producer who does not care to market his poultry, that is, for laying white eggs. All the Spanish breeds, the Minorcas, the Black Spanish, the Leghorns, the varous kinds are excellent layers and fine sitters. The Minorca is supposed to be the original from which the White Faced Black Spanish was bred. The fanciers have developed the white face and enlarged the ear lobes. The Minorca is the original stock from which they were bred, and have the great egg-laying qualities of the old-time Black Spanish. The French breeds, the La Fleche and Houdans, have dark legs and white skins. They grow fast, have a great deal of breast meat, and very tender flesh. They do not sell as well here because they do not have yellow skin and yellow legs. I think that is a fad, but so long as the market calls for yellow legs and yellow skin, you have got to meet the demand. I believe that it would be very easy to turn public taste away from yellow legs and yellow skin if one had control of the press of the country and would work along those lines. Those who have bred yellow skinned fowl have

pushed their breeds so that they have gained the advantage. The French prefer white skinned breeds to anything else. Lately in England the yellow legs and yellow skin have become more popular in the markets. Several game fowls are not great layers, but have very full breasts and a great deal of muscle and flesh; in fact, the flesh is a little too hard. The market men as a rule think they are a little too firm. They want soft meat rather than over-development of muscle. A cross of the flesh-producers with some of the hardy breeds makes very good fowl. Some of the later breeds have been made by combining the hardy breeds with egg-laying breeds and flesh producers. The Plymouth Rock is such a breed, and is one of the most popular breeds in the country. The White Wyandotte is such a breed. The Plymouth Rock is made up of the old Dominique and the Black Java. The old Cochin blood is in the Plymouth Rock. The White Wyandotte is made up orignally of Brahma and Hamburg. The Hamburg is one of the greatest egg layers. In the white Wyandotte we have one of the best flesh producers that is also a good layer. The White Wyandotte does not lay the brownest eggs, but lays a light brown egg. The Plymouth Rock and the White Wyandotte are classed as the best all-round fowl, and they are very popular at the present time. The La Fleche, Hamburgs, and various other breeds are rather getting out of popularity, but they are valuable for crossing. There is hardly a breed of fowls, however useless they seem, but what is valuable for crossing in with some hardy breed for certain purposes, and later, as the industry develops, there may be a demand for something we are not using or selling now at all. Of course much may be learned at poultry shows about the size, shape, and appearance of fowls, but you do not get usually the correct idea of what they will do in the yard until you have some acquaintance with them, or get the ideas of those who have. The poultryman has more material to draw from than the breeder of horses, cattle, or sheep. There is one breed in Rhode Island that is very popular, the Rhode Island Red. It is the best of the old Brahma and game blood, and

some Leghorn. It is a medium-sized breed, very active, very hardy; never has been bred for show; hardly ever put into exhibition. It dresses well for market, and for its size lays the largest eggs of any breed I know. I know one man who keeps these fowls scattered about his farm. He has sixty or one hundred henhouses, each containing from twenty to thirty or more. They rarely get cold or catch the roup. I have seen them wading around in the wet in winter, and he says: "My fowls won't need overshoes; they are all right." His houses are built of boards, and there are cracks in the front and sides of the house. The back and north side is battened, and he doesn't have any dropping boards. Once or twice a month he sends a team around and digs it out, and once a year digs the earth out of the floor and fills it up again about a foot above the surrounding ground, so the water doesn't stand there. He manages things very simply, and gets along as well as anybody I know. He doesn't get the greatest profit, but conducts his operations with the least risk of any man I know of. If he is sick everything doesn't go to smash, as it does with the modern long houses and more advanced methods. There is some opposition among fanciers to the teaching that fowls should be crossed to get the best profit, but I believe it is just the same with poultry as it is with cattle and with various animals. A first cross gives greater vigor and greater hardiness. Even a worn-out show bird or animal, if bred with common hardy stock, will give progeny that is much hardier than the old stock, and at the same time has the improved qualities possessed by the show stock. And we believe that those who do not breed poultry to sell, for show, or for breeders, will in many cases do the best if they cross two pure breeds with a certain object, or grade up good, common, hardy stock with males of one breed. From my experience I should advise that every farmer should buy pure bred males. A great many will do still better to buy pure bred stock and cross it, and a less number will do still better yet to keep pure bred stock and raise it for both pleasure and profit, and sell breeding birds to the farmer. There is a class, less in number, who can with

profit breed exhibition birds and sell them for the shows. Each class has its use, but I think it is a sin and a shame to try to teach and advise that every farmer should breed exhibition stock, or even to breed nothing or keep nothing but pure bred stock. Everybody should improve his methods and adapt the methods to his own needs and circumstances. It wouldn't do to advise every farmer to build a five thousand dollar barn. It would be just as wise to advise one to keep nothing but pure bred stock.

In regard to poultry management, I believe there is a great deal of money wasted on poultry houses. I don't think there is as much squandered on any farm building as on the poultry house. They should be cheap and simple; the simpler the better for the farmer; and what you build should depend on the attention you are willing to give. To build the modern house, as kept and run by some fanciers, and then not give any more attention than some farmers now give to their fowls, would invite disease and cause disaster. Improve your houses and plans only so far as you do the attention and care and intelligence you give them. I believe the safest plan is to have small houses scattered about the place, but if any one will give the attention he can do best with long houses, but he is then more dependent upon the skill of help. I would repeat, all farmers should make progress and improve their stock each year, and adapt their methods to their own needs. What is wise for one to do may be unwise for another to do. It would not be best to follow the methods of some of the fanciers and specialists. The more you adopt the up-to-date methods the greater your risk from disease if you neglect them. Mr. Secretary, the questions usually are the most valuable part of such a meeting. If any one differs with me in the views I have taken, or would like to draw out anything more, as far as I am able I should be pleased to answer.

DISCUSSION.

Secretary Bachelder: I was in a farmers' meeting in a neighboring state last winter, when the subject of poultry-

growing was under discussion, and the speaker was asked by a person in the audience what they should do to prevent hens from eating eggs. The speaker advised cutting off the hen's head. There didn't seem to be any doubt but that would accomplish it, but it was regarded as rather heroic treatment. There may be some person present who might like to have the Professor explain in just a word the treatment that is recommended for preventing fowls from getting this habit.

Mr. Cushman: I think the best plan is to have the nests where they can't very well see the eggs, and where if they break an egg they won't immediately eat it. The trouble very often starts from a soft-shelled egg being broken in the nest. If proper care is taken this may be avoided. The fowls kept in confinement without sufficient grass, and that are at all times craving for something that they don't get, are very apt to commence to eat eggs. It is a matter of wrong treatment. Of course, after they have learned the habit, it is like other habits; they will keep it up; you can't stop it. I have heard of people stopping it by filling empty shells with mustard and letting the hen eat that, but unless the bird is something very valuable I wouldn't do that. I would cut her head off. But this may be prevented if you understand what the fowls really need. One bird needs one sort of treatment; another bird another sort. If you have two or three Brahmas and Leghorns in one flock, one gets what it wants and another doesn't. Keep your fowls uniform, and then treat them according to their needs. A good fancier will watch every day to see how his fowls look and how the droppings look, and change his feed as appearances change. In that way he keeps the balance. As the weather changes the food should be changed. The minute you see a sick fowl, take it right out. Don't leave it with the others. That will save lots of fowls being killed off by wholesale.

Mr. Waterhouse: I am told that too much skim milk fed to hens will cause soft-shelled eggs. How about that?

Ans. I can't tell from personal experience. I think soft-shelled eggs usually come from over-feeding or over stimulat-

ing, or getting them too fat. I myself wouldn't say that too much skim milk would cause it, but I should take pains in feeding skim milk to mix it with meal so the food wouldn't be too sloppy. I don't believe in feeding any fowls very sloppy food. It is natural for a hen to eat dry grain and grind with the gizzard. If you fill her up with sloppy food the muscles of her digestive apparatus get soft and weak, and she gets indigestion. The dryer you feed the food, the better it is.

Mr. Lyman: You would have the different breeds kept separate; you wouldn't mix?

Ans. That is the ideal way. Few do it.

Quest. How about feeding warm food?

Ans. If you fill a hen up with a lot of hot stuff, and let her go out in the keen air, like a person she is likely to take cold on her lungs, and while she will assimilate food better, perhaps, for a while, and lay better, I don't think it is a good plan. I don't want my fowls to have hot stuff. I have seen how it works. Another thing: Too much soft food will make the eggs infertile. You get more eggs on soft food, but they won't be fertile. Feed on hard dry grain and meat; you will get more fertile eggs than in any other way, and grass will do the rest. You can't get the greatest egg product and at the same time get the greatest per cent of fertile eggs; it is an impossibility.

Mr. Lyman: How about the drink?

Ans. Some warm water. I suppose it is all right to take the chill off, but I always felt in regard to my fowls that if they are in good condition and eat dry grain, a good cold drink was a kind of tonic, but if they are eating hot stuff in a confined house, that cold drink might chill them and put back the egg laying same as it would the milk qualities of a cow kept in a warm barn.

Quest. How about the effect of food on the quality of the egg?

Ans. There is a good deal said about the richness of brown eggs and white eggs. In my opinion, all there is to it is this: A Leghorn will lay herself to death whether she is fed or not;

she can't help laying; and toward the latter part of her laying she hasn't the material to make a good rich egg. A brown egg layer is a different bird, that will only devote so much time to eggs anyway, and the eggs are always rich. The game fowl will have the richest eggs of any fowl, and they lay few eggs. They are supposed to be the richest and finest flavored. Food without a doubt has a great deal to do with the quality and flavor of the egg. Corn will make eggs yellow. Corn is good for hens if you don't give too much of it. If I could have but one grain, I would have corn, but I would have to have meat and grass and a good many other things to go with it. Corn alone will dry up a fowl, make it too fat, and give it a bowel trouble which is very hard to cure.

Mr. Gerrish: In regard to warm food, I once visited a poultry man who made a practice of keeping his corn around the chimney in the back part of his house, keeping a bushel or two around the chimney, and it got, I should say, about blood heat. Would you object to feeding corn about that temperature at night to the fowls?

Ans. I should think that was very desirable. Corn in midwinter is sometimes almost like ice. I think dry hard corn with the cold taken out of it would be very desirable.

Quest. Do you think fish would be beneficial fed to hens?

Ans. I have a friend who keeps three thousand hens. He has small houses scattered all over the farm, and takes great pains to have the eggs the right flavor. He says our three-year-old hens are what make our reputation and give us our business. We appreciate the pullets for what they are and what they are going to be, but we depend on the three-year-old hens for eggs that give us our reputation. But he says we have to take great pains about the flavor of our eggs. If they are kept in cases that are musty, they will get a musty flavor; if they are kept in old straw they will get an old straw flavor. He says: "We take great pains to feed no fish food, no sea food." Whether you refer to fish right from the sea, or what you catch in an inland pond, or to fish scraps, I don't know. I should prefer good beef scraps to anything else, unless it is fresh butcher's scraps, fresh meat and bones.

Mr. Lyman: I would say that one of the greatest breeders I ever met in my life assured me that a neighbor of his fed fish to his fowl when it was so far decayed that the eggs broken immediately after being laid were bad and not fit to eat; and in addition to that, that that man couldn't raise chickens from his eggs, and had to get eggs from his neighbors.

Mr. Cushman: When I visited Long Island, where there are a great many duck raisers, I found they were catching fish, cooking them, and feeding them to the ducks. When I went to the New York markets, one of the men there said that the Long Island duck market had been spoiled by feeding fish. The ducks sold at nice hotels would smell so strong of fish that they were thrown out; they wouldn't buy them any more; while the Boston men who used beef scraps were getting from 22 to 25 cents, and the Long Island people were getting only 14 or 15 just because they had hurt the name by feeding fish. The growers claimed if they cooked the fish and skimmed off the oil and then stopped feeding the fish two weeks before they fattened for market, they wouldn't taste, but the only ducks now sold in New York have to be warranted not fish fed.

Mr. Bill: A few years ago, perhaps fifteen years ago, in southwestern New Hampshire and southwestern Vermont and Massachusetts, we raised a good many turkeys; had no trouble in raising them, and used to raise large flocks. They were the most successful of any of our poultry, but all at once a change came around, and we couldn't raise turkeys. We have occasionally tried to raise flocks of turkeys, but it is a failure every time. I would like to ask what the cause of it is, what is the remedy, and how we can grow turkeys again.

Mr. Cushman: I will set to work on that very question down in Rhode Island. Rhode Island is celebrated for turkeys. They bring from five to ten cents more a pound, which is not only because they have got a reputation, but breed them in such a way that they are satisfactory. We found that all through this region this trouble would come on. Perhaps a man would raise turkeys on a new farm; the first year do well; the next year not so well; the next year have to give it up.

The neighbors around the experiment station almost gave up turkey raising. Perhaps they would hatch out a hundred and raise twenty-five. They would have yellow droppings, drag around and die. We opened some young turkeys and found their livers spotted with yellow. We sent some specimens to Washington. They found it was due to a micro-organism which was similar to the micro-organism in human dysentery, and affected the lower bowel first and then got up in the liver. In trying to raise turkeys again we got wild turkeys, and found they had more vigor and hardiness, and were less apt to have that disease, still some would die anyway of that disease. Evidently the turkeys that had it left the seeds of the disease on the ground, and in some way the little turkeys must get those germs. We don't know how to prevent this disease. The best thing I can say is have just as strong, vigorous stock as you can get.

INTENSIFIED HORTICULTURE.

PROF. L. H. BAILEY, ITHACA, N. Y.

How shall we intensify horticulture? I don't know how extensive the horticultural interests of New Hampshire are. I know, in fact, that in some directions they are not very extensive. I believe there is great opportunity in New Hampshire for the growing of certain kinds of horticultural products. The introduction of my remarks will not apply so much to horticulture in particular as to agriculture in general; and perhaps they might be applied also to dairying. In the first place I think I might ask whether we shall intensify horticulture; if there is any need for intensifying it. Have you ever thought that, after all, it is not so much what we raise, what we sell, what we get therefrom, as the pleasure, the satisfaction, we get from that operation? This is really all we are living for. I have been very much impressed the last few years, in traveling up and down the world, to notice how many people of wealth there are who are still really unhappy. I have had occasion to notice numbers of people who spend all their days roaming up and down the world seeking pleasure; persons who are running down the coast to Florida, spending time at the great hotels, who go to the Mediterranean and Italy, and as far north as Norway and Sweden. These people are seeking all around the world for something to live for; yet I come here and hear the song of the old darkey who wished only for his old home. And we find persons who are satisfied right here upon the farm. I wonder if it isn't very largely a man's attitude toward life as to how much he is getting out of it? I feel that it is not so important that we get so much of the goods of life as it is that we enjoy these goods more; and I do not believe that luxuries are the things that make men happy. I believe the things that make men happy are, first, peace of mind; second, simple comforts of life; and these every man can have on the farm. I am satisfied that we have heard

much wrong teaching in regard to agriculture. We have been told how a man can make money on the farm, and we have heard of men here and there who have done well in agriculture and have amassed a fortune, but these men compared with the whole number of farmers are few. How many persons who go into trade expect to be wealthy? How many persons who labor in shops expect to be wealthy? How many who go into manufacturing expect to be wealthy? I suppose few men expect to be wealthy, but they all expect to be happy; they all expect to have enough to live on, to keep the wolf from the door. Don't you see we are emphasizing the few rather than the many when we tell farmers that money can be made on the farm? And although I am a farmer, and expect to spend the last of my days on a farm, I never expect to make money as men make it out of large manufacturing enterprises. I never expect to be rich. It is not my desire to be rich. But persons on a farm can pay their debts, can live comfortably, have peace of mind and all the virtues of life, which are the real things after all. So, in the first place, I want to set my audience right. I am not going to tell anybody he can get rich out of horticulture. I don't believe the majority of men can get rich, and I for one am thankful that agriculture is one of those pursuits which yields a good living, but which does not tend to wealth. The middle element of society is the one after all which is the element of stability. There are men who have certain executive abilities and who have a passion for accumulating fortunes, and these men are often the best men in our communities. I wouldn't say anything against the passion for wealth, only I don't believe the great majority of men can arrive at that state. We are going to have a speaker later on who is one of those men. We cannot all reach that degree, and I do not believe it would be well for our country if we did reach it, however well it may be for some. So I believe that the best plan is first of all to improve the farmer. I believe in educating a man first to enjoy the things near at hand, to get the most out of life, and then farming is successful. I believe it pays for a man to spend four

years in college, if in that four years he does not learn to do a single operation better, but if it makes him more contented to live upon the farm; if, for example, it does not teach him how to plow any better than before, but if he comes to understand all the living principles that are set at work. People are too apt to believe that the four years are lost unless some great achievement comes therefrom, but don't you always hear a college boy say that the four years he spent in college were the happiest years of his life? Four years spent at college have paid for themselves the moment a man comes from college, because the man lives all the time he is there a larger, deeper, and broader life than ever before, because his mind is open to all the stimulating influences. He goes away with more sympathy for men; his mind is broadened, and he will be a better farmer thereby. That is my feeling about college education. I do believe it will help a man to double his capability in a great majority of cases. I believe it will enable him to grow more apples, but if it doesn't I believe that to the country boy it is worth all it costs. I felt when I got through the four years' course that if I never practiced anything I had learned it was worth all it cost me, and I am doubly sure of it now. You go abroad for the summer, and do you think so much of the good which is coming to you in the future as you do of the broader life it gives you? It is just that which the college does.

First, then, I should begin with the farmer if I wanted to intensify horticulture or intensify dairying. I should want the man to live more intensely himself, and to love the things near at hand, and to get all the good out of life as he goes along. It seems to me that unless we do we never can make good farmers.

Coming to the more practical topics, I wish to say that intensification of horticulture depends first upon the man, the intensification of his own ideals; in the second place upon his ability to reach the market with the things which he produces. He has a certain ideal which he wishes to attain; then how shall a man market his produce? There are two essential elements

in the marketing of anything: First, growing what somebody wants; second, taking it to the man who wants it. In essence, that is all there is to it. The larger part of our farming is the growing of crops for everybody or for anybody, which never pays, but the growing of crops for somebody always pays. Here is Mr. Rawson, who grows certain things for certain persons, or for certain demands. He knows those demands are reached by the things he grows, and that those persons must have the things. I wish to say that it does not pay to go to any expense to market the common things; it does not pay to push them; there is not enough in them. It is the unique things which give the profit. The market sets the price for the common commodities; the man sets the price for the uncommon commodities. Mr. Rawson sets the price for his cucumbers; the market sets the price for yours and mine. He has the cucumbers when you and I haven't them. And that is the principle which runs through trade; the market sets the price for common things; the producer for unique things. A man can't succeed until he gets things which the market wants. I imagine that our farming is very largely a negative thing. We sow and reap and send things off to market, letting them fall into whatever niche they may. It isn't positive. A man hasn't any particular ideal in life. It is like the Irishman's definition of salt, that material which makes the potatoes taste bad when you don't put any on. It is largely the same way with the crops we grow. We are not growing for any particular purpose.

The intensification of horticulture is getting more satisfaction from life. We get it in the first place from mental ideals; in the second place by being able to market the things which we grow specifically and directly; third, I believe the success in the intensification of horticulture lies in the individuality of the man. I believe it lies in the ability of the man to single out those particular things which are especially adapted to his locality and which are especially adapted to him, which he can grow well. Persons will say: What breed of cattle shall I raise? What variety of apples shall I grow? I

ordinarily ask the man to answer the question himself. Persons say: What variety of peach shall I cultivate? I say, What do you want to grow peaches for? I want to grow them for market. Very good. What is the market which you have for peaches, an early market or a late one? Well, a late market ordinarily is the one for which I get the best price. Well, then you answer two questions. What kind of a peach do you like best—yellow or white? Oh, yellow peaches best. Well, what kind of peaches can you grow in your locality? Before you get through you can analyze the man's own ideas, although he has never yet analyzed them, and he has answered his own questions nine times out of ten, and you have no responsibility for it. I never recommend a specific variety, for I know the man must have his own ideals. I should like to see all people who have the idea of going into horticulture rent their houses for one year and move into town, find out what is wanted, and go back to the farm with a definite idea. The best example of that is Judge Wellhouse of Kansas, the apple grower, who has been called the "Apple King," and who is said to have spent eleven years in studying varieties of apples before he planted a tree, to find out what trees were adapted to his soil and the general character of the market. Persons say such men are geniuses; all men are geniuses who are successful. Genius depends upon three things: First, the man must be full of his subject, and feel he has some mission; second, upon his power of analysis, a man must be able to see through a thing; third, it depends simply upon work. That is all genius is after all. So success lies in the individuality of the man. Whenever I find a man who says, "I am going to raise celery, or apples, or asparagus because John Jones does," I put him down as a failure. The man who tries to copy his neighbor, who hasn't any ideals, is nearly always a failure. A man with an idea will go to the man who has made a success and get all the information he can: but, after all, a man's ideas are his own, and so far as he merely copies a thing it isn't his own.

I am coming to my subject, that is, what particular type of horticulture shall we take up for New Hampshire, and inas-

much as I know nothing about New Hampshire whatever, I can give you a great deal of advice. I wish to speak about the variety and intensification of horticulture. We intensify horticulture by having certain definite ideals and driving directly at the point. Let us suppose you are going into strawberries, raspberries, apples, or what not, and the first thing that comes up to your mind is, what variety shall I plant? Nearly always the first thing a man asks is that question. It is not a fundamental question, yet it is a very important one. I wonder if you have ever thought that nearly all our horticultural literature is built upon the variety idea; that the variety is the one fundamental thing in horticulture? It is not so. The notion came about because nearly all the books were written before the large-area orchard had been born. Downing's book was written when American horticulture was in its amateur stage. People didn't care so much for the profit as for the satisfaction of growing certain varieties. Nearly all these ideas have been copied from European views on horticulture. There is no country in the world where the general growing of fruits is done upon so large a scale as in North America. The orchard is better cared for here than in any other place. What is the first thing in the growing of an orchard? The fertilizing of the soil, the tillage, etc.—these things are fundamental. The variety factor is more or less an incidental one that comes later on. Yet I wish to say that the variety factor is nevertheless a very important one, because the more individual ideals a man has, the more narrowly does he separate out the varieties which he wishes to grow. Here we have strawberries, one hundred varieties. Shall we grow those? No; that is not intensification. How many varieties shall we grow? How shall we know which of those varieties we shall grow? Let us see how we go to work to find out.

There are certain general problems which we must take into consideration. In the first place, the purpose for which it is to be grown. The man who grows strawberries in Oswego, N. Y. (which is one of the largest strawberry sections of that state), must have a different ideal from the man who grows

them in the neighborhood of Boston. The first step in the intensification of horticulture is to find out the particular purpose for which we wish to grow a thing. That will vary with the individual place in which those varieties are to be grown, and all the other surrounding features. I know a man who has been making money the last few years out of grapes, and grapes in New York state are being very largely and very cheaply grown. I asked him how he did it. He said: "In the first place I asked myself what kind of market I wanted to reach. Do I want to ship my grapes to Chicago, St. Louis, Denver, Portland, Minneapolis, and all over the country; or do I wish to centralize and specialize? Now I live upon the line of a certain railroad; therefore, I must ship my grapes upon this road. What markets does this railroad reach? It reaches Buffalo, and Buffalo is nearer the Chicago grape region than I am. I can't ship to Buffalo. Rochester is very largely in the position which Buffalo is. I can't ship there. The other towns, Syracuse, etc., have their supplies of grapes. I can't ship north. I don't see any other way for me than to go south. I will go down into Pennsylvania and find what I can do there in the iron and coal regions. Here is the place for my grapes." He is growing Vergennes for one thing, which very few people in that region grow, and after these grapes came into bearing I remember very well his going into that mining region and visiting the groceries here and there, and saying, "I have these grapes. I know they are what your folks want. I want you to handle them for me." "We haven't handled your grapes; we don't know anything about it; we don't know whether we can do anything for you." He said, "I know you will. I will take the business end of this matter. If you will agree to do your best to sell these grapes I will agree to give you so many baskets every day for such a time." The result was he got the trade in those coal towns. I don't believe we can intensify horticulture unless we find the intensified outlet for our product. I don't believe it pays us to grow grapes in general, to be sent over the land to be bought by this and that man incidentally; certainly we cannot with

these grapes which require a great deal of energy in the growing of them. I know another farmer who, in looking over the things which the market wants in the summer time, saw the highest price which was paid for any one thing was muskmelons. These muskmelons came in largely from the South and middle south. He said, Why can't I grow muskmelons right here? He saw there was a need in the market for that particular thing, and learning to grow muskmelons has made a success of it. A young lawyer is graduated, and he goes into an office and reads law and looks over the ground, and after awhile he picks out some city or some place where there is the least competition, and there he goes and hangs out his shingle. I believe the farmer has got to specialize his market sharp and clean just that way.

All this intensification of horticulture does not originate with ourselves. The world is moving forward. The struggle for existence is upon us. There are certain agencies at work in the world which are intensifying forces. Pests are among the most potent factors in intensifying horticulture. The man has got to fight these things, and a man cannot go into the field year by year and fight insects and fungi unless he is wondering all the time whether it pays or not. He is going to give better care than before. I think statistics will bear us out that the potato crop was never so valuable as it has been since the potato bug has come into existence. The very fact that we have got to think about these things, that they are being forced upon us, is one of the things that has made for the intensification of horticulture. In those countries favored of nature you will always find the poorest farmers. I have noticed that time and again. One has only to go through the countries where nature is so bounteous to see that the people are sluggish; largely the result of climate, partly because they haven't any incentive to work as they have in countries where the climate is against them. I believe, take it all together, you will find the most hardy and progressive class of farmers in New England, and in some parts of New York state. It is in these countries where the people have to exercise the most

mental ingenuity that you will find the best class. I am looking to the apple scab to intensify apple-growing in this country. I have sometimes wished the apple scab were more vigorous than it is, there are so many orchards in the country that ought to be cleaned out.

I have said that we need to individualize and specialize and to grow those things that are adapted to our locality. What is to be the future of New Hampshire? Shall we begin to grow miscellaneous crops here and there, and depend upon the accident of a market for them, or grow those things which the market wants and which are especially adapted to our state? I believe there are three things to which New Hampshire must look for her agriculture, and if I were to name those things in the order of their importance as they strike me, it would be this: Dairying first, apple-growing second, and forest preservation third. Now those are three things which are all possible in New Hampshire. They are three things which work together. The land which cannot be used for dairying can be used for orchards, or can be used for forests. I do not know anything that works in with your dairying better than horticulture. No state is better adapted to growing apples than New Hampshire, I believe. We know as a matter of fact that the apples of New England and Nova Scotia and Ontario are nearly always better keepers, better flavored, and in higher demand than apples grown farther west and farther south. I am convinced that middle New England could compete with New York in the production of apples. It has been my fortune during the last few years to learn a good deal of the selling of apples in European markets. The demand is nearly always, amongst those persons who are critical about the buying, for apples grown in the northeastern part of the United States. It is well known that all these comparatively rocky lands in the eastern states produce a very high quality of apple; apples which are not over large; in fact, if anything, they are rather under size as compared with those in the West. They are better keepers, and the rocks in the soil constantly decaying give us a supply of potash which is very valuable for the

growth of the apple. I believe the growing of the apple is to be the future horticultural industry of New Hampshire. I would not limit it to the growing of apples. I believe there is a large strip of southern New Hampshire which is admirably adapted to the growing of plums. You know that the Boston market is supplied very largely from western New York, which is the largest growing section outside the prune-growing section of California. Cannot you, right here at the door of Boston, compete with persons from western New York? There is no reason why plums cannot be grown here. The climate is no more severe than in many parts of New York. I don't see any reason why a large part of the lands which perhaps have produced nothing intense the last few years except taxes, cannot be made to produce plums to the best advantage. Nova Scotia is raising plums. If they can, you can. You can grow just as good plums, and are in the neighborhood of a large city. I believe cherries can be grown here, and grapes. I doubt, however, whether you will ever be a grape-producing country. I doubt if you can compete with the grape-growing regions of other states.

I wish to take five minutes more in talking about the intensification of the apple. I judge from the appearance of a large part of the apple orchards in this state that they were not planted with any particular idea save one, that is, to occupy or utilize the ground. I believe in the first place we must have as distinct an idea of apple-growing as of anything else. I don't know why it is that people should have thought that corn needs tillage, fertilizing, phosphoric acid, and apples need nothing. I cannot conceive how that thing has ever come into existence, except for one reason,—that apple orchards came to be in this country when there was a comparatively small market for apples themselves, and nearly all went into the cider barrel. It may surprise you to know that in early New England the cider barrel was the destiny of the apple. It is only recently, comparatively, that the apple has come to be a commercial article anyway. If you should go through Europe to-day you would find that the

Germans and French want their fruit to drink. They don't market it as fruit nearly so much as we do. They want it made into cider and wine and brandy.

We have been very much misled, I think, in New York and New England, with the great success in apple-growing in the western states. Because the Ben Davis has succeeded so well with those people, there has arisen a great demand in western New York for such varieties. It does not follow that because they succeed in Kansas that they will in New York. You have apples that do better here than anywhere else. They can grow the Ben Davis better in Kansas than you can, and they have the market of the world at their command. We cannot compete with the West in the growing of Ben Davis apples; they cannot compete with us in the growing of Baldwins and Northern Spy and Greenings.

Grow your old varieties of apples. If you do grow new varieties I should always give the preference to those varieties which do better here than anywhere else.

WHAT I DO NOT KNOW ABOUT FARMING.

W. H. SISSON, CORNISH, N. H.

Horace Greeley once wrote what he knew about farming, and if my memory serves me right, much comment was made thereon.

The different members of the Board of Agriculture, and others learned in farming and the different branches connected therewith have spoken throughout the state during the present season and in times past, on a variety of subjects that cannot fail to be of interest to all engaged in the tilling of the soil. Our agricultural journals teem with instructions, experiences, and advice until it seems to me, that there can be but little left for any one to say, only "to thresh over the old straw," and present old subjects clothed in new language. Yet there are a great many things that I do not know about farming, and which from observation many others do not know, or, if knowing, do not practice. Therefore I hope you will pardon me if I depart from the general rule followed by the members of the board, of delivering an address and then being questioned by the audience, and turn the tables, and by asking questions of my hearers, perhaps draw out from some present new ideas, and by their knowledge better inform myself, and others be benefited and escape from failures and disappointments. My grandson, a lad of five summers, a short time ago so tired me with the numerous questions he asked, that I said to him, "Please, Walter, do not ask so many questions." He looked up to me, and very soberly said, "Grandpa, how am I ever going to know anything if I do not ask questions?" and if my address makes you tired and you feel weary, please pardon me as I did him.

Since 1888, I have been connected with a co-operative creamery, and for six years of the eight I have kept the books, and during this time a great many things have come under my observation, and of some of these I shall speak, and first of all comes this question: Why is it that farmers

as a rule do not apply business principles to farming, the same as a merchant or manufacturer is obliged to? We all know that a merchant buys his stock of goods, places on them a certain per cent of profit, and offers them for sale, relying on the profit alone for his support, well knowing that gain must be made or he cannot replenish his stock and support himself, and that selling at a loss means failure. A manufacturer figures the items of cost of production, even to the saving of a fraction of a mill on each box in which his products are to be packed, well knowing that in these days of close competition, it is necessary so to do, in order to put his goods on the market at a gain and make sales; he must produce at the least possible cost, so as to sell at a low figure, or some other manufacturer will undersell him and failure will be the result.

How is it with the majority of our farmers? In 1890, while taking the census of the town, certain questions were asked of each farmer as to the different products of their farms, and in only two instances did I find a book account kept enabling me to get a correct answer to any question asked, and I think I do not judge harshly when I say that, in my opinion, this is a fair sample throughout the state. How many farmers can tell me how much a ton of hay costs them when put in their barns; how much a bushel of corn costs? Whether the hay and corn were fed last year at a profit or a loss or whether it will be this year. In making out the creamery pay-rolls for the current year, I find items like these: Two cows, for whose butter during the year I have paid $87; eight cows, for whose butter I paid $85.27. In each case the amount of milk saved at home could differ but little, as the size of each family was about the same. Does it require a college professor to figure which party kept cows at a loss or which at a profit? During the time the creamery has been in operation the directors have helped farmers short of means in the purchase of cows, taking an order for a certain per cent of the butter money each month until the cows were paid for (that is, until they had paid for

themselves), and at different times I have had such an interest in thirty or forty cows. If I go out to buy or send an agent, the question asked first after the cow offered for sale is looked over is, "How many pounds of milk did your cow give last year?" Next, "What is her test?" and the answer received in ninety-nine cases out of a hundred is "I do not know; she gives a good mess, and it's good milk," and from what I have learned from experience and inquiry, I do not believe to-day that one half of the cows in the state are paying their keeping, yet more than one half the farmers are crying "hard times; no money in farming." "We cannot get anything for our products," when, in my opinion, the largest blame lies at their own doors in not applying business principles to farming. It is an absolute certainty to me that an average crop, an average cow, an average farm product of any kind, will not pay and never did pay a farmer, and my experience and observation teach me that the farmers who make a profit are those who raise more than an average crop, and those whose dairy consists of a herd of more than average cows, and in each and every case of those who apply business principles to their farms, and the question I would now ask is, why will our farmers be content with an average or less than an average? In the year 1888, the average as taken from the pay-rolls was 167 pounds of butter per cow, netting $30.06; in 1890, 180 pounds, netting $33.54; in 1892, 195 pounds, netting $38.64; in 1893, 208 pounds, netting $42.28; in 1894, 225 pounds, netting $48.53; in 1895, 174 pounds, netting $32.53.

These are actual figures, and are not estimated. The average cost of keeping with us is about $40 per year, at market prices of hay and grain, and you can plainly see that in only two years out of the six have the cows paid their keeping.

One may well ask what is the cause of the drop in 1895, and the answer I will give is the one given me by the patrons, "We have sold our best cows." Why? "Because we can get good prices for them," and so off go the best cows and the poorer ones and the scrubs are kept to help make the farmer

still poorer. Would a manufacturer, if he had invented a machine whereby he could make two yards of cloth for what it had cost to make one or three pairs of hose at a cost of two thirds what it had been, have sold that machine to a rival concern? Do you for one moment think he would? I know the answer will be no.

An acquaintance of mine, nine years ago, had the misfortune to meet with an accident on a railroad. He had been in the railroad's employ from a boy; knew nothing about farming. His injuries were such that he must leave what had been his life work. He came to New Hampshire, to the farm of his wife's father, not quite an "abandoned" one, still badly run down, and commenced to learn a new trade. Cows were something he knew but little about and realizing that, in his opinion, dairying was the best of any line a farmer could follow he employed a good dairyman to go with him and select cows to form the herd. The first advice he received was, "Buy good cows to start with, and do not try to see how many you can buy with the money you wish to invest. Buy a thoroughbred male and breed." He purchased eight good cows. Last year he kept fifteen, and made from them 4,580 pounds of butter. This year he will keep twenty, and at present indications will make 6,000 pounds. He has made dairying a study and a success.

I copied the following from a Vermont paper: "George W. Whitney of Williston, Vt., owns 22 grade Jersey cows; the milk of these cows is taken to the Hinesburg creamery. In 1895 this herd yielded 154,000 pounds of milk, and the gross dividend from the creamery was $1,543, or an average of $70.13 per cow. This, besides supplying two families with milk for the year. The largest yield per cow for the year was 13,147 pounds. The yield one day from this cow was 65 pounds. The average test in butter fat for the year was 4.38." I wrote Mr. Whitney, asking him how he had raised up such a herd, how he fed, and some other minor questions, and his answer plainly shows that he is applying business principles to his dairy. I will quote his own words: "I

keep tablets on hooks nailed up in the barn, and weigh nearly every cow's milk each milking to know whether they are shrinking or not. I feed a balanced ration. To cows that make nearly two pounds of butter or over a day, a ratio of about 3 to 1, feeding bran and Pope's cream gluten or bran and cottonseed meal twice a day the year round, costing about $18 per month in summer and thirty to thirty-five in winter. We feed each cow all she can assimilate and make into butter. Our best cow gives at present time (Nov. 14, 1896) 46 pounds of milk per day, has been averaging about 50 pounds with a test of 4.15. We have a heifer 25 months old when she calved, Feb. 24, 1896, that had given up to the first of November 7,136 pounds of milk, and is now giving 19 pounds per day. We raise our heifer calves from our best cows. About twenty-five years ago we commenced to raise calves from cows that gave not less than forty pounds of milk per day, using a full-blooded Jersey sire with a record on his mother's side for milk and butter, and have followed this course ever since." I could name other instances all amounting in the end to the same, and assure you these are not isolated herds, still they are so few that they seem like oases in the great desert.

Can any farmer afford not to do as these have done? Can he afford to sell his products at less than cost any more than the merchant or manufacturer? Yes; perhaps he can. Why? God, in His infinite mercy, will probably make some grass grow on the farm next year, and therefore the farmer's stock in trade may not disappear as quickly as the merchant's, who sells at less than cost. But one thing is certain, give such a farmer time enough, and you will find it will just as surely keep him poor or failure will be the result. Ought he so to do? No! I see but little reason now, even with the present outlook, why one should be discouraged with dairying, especially as compared with other lines of business. It may not be quite as profitable in the future as in the past. It has only obeyed, or rather followed, the law of nature, which always has and always will bring all branches of any great industry to a common level sooner or later.

While all our speakers, all our papers are urging the farmer to improve his stock, how many are following such advice? Though it may require study, a better application of business principles, and the raising of dairy cows that shall pay their keeping and show a balance on the profit side, and by weeding out those that do not pay their board, I honestly and firmly believe the dairy business is the best branch a farmer can follow, and will be in the future, and many who are now finding fault with the times will see the "error of their ways" and "repent and be saved" from utter discouragement and failure.

Get out of your old ruts; get into the current of dairy intelligence and enthusiasm. Keep only the best of cows. Test them constantly and carefully, and weed out the unproductive ones quickly. Feed them well and economically according to varying feed prices. Read the best of creamery and dairy publications.

It has been said that "Hay is king" of the crops raised, especially in New England, and I have a question to ask right here. Why do the majority of farmers mow forty or fifty acres to get twenty or twenty-five tons of hay when the same amount ought to be cut from less than half the acreage? I will just note an experiment made this season by a merchant who had purchased a few acres of land so that he could get a little out of door work as exercise, and thereby benefit his health. On an acre of land he cut in June 500 pounds of hay. He immediately plowed the piece and seeded it down again, sowing Hungarian, timothy, and clover. He cut 1½ tons of Hungarian, has a "good catch," and I look forward to next summer to see the result. The hay and Hungarian sold for enough to pay cost of plowing, seed, and fertilizer into less than five dollars.

When a boy of sixteen, we had in our town a fairly well-to-do farmer, for those days, who for years would not use an iron plow, because he "knew it would poison the soil," so he kept on plowing with the old wooden plow long after his neighbors had used the more modern make. Are not a

good many of our farmers plowing with a wooden plow to-day? Yes, in various ways, particularly by keeping cows that will not produce over 150 to 200 pounds of butter per cow, when, in my judgment, one making less than 250 pounds a year will not pay.

We have a class of farmers just like the one I have mentioned. "We know all about it," and the contrast between them and the intelligent, reading, thinking, and progressive farmer is readily seen. The first do but little reading, the others read, experiment, and get ahead while the first wait and watch the results, and fall into the rear of the procession and march in the hardest place. Why, in this enlightened age with our papers, magazines, and granges, is this so?

I know of many farmers who prefer to breed from a scrub sire because, to use their own words, they "cannot afford to pay a dollar for use of a thoroughbred sire," cannot afford to take an agricultural journal when they can have a good one a year for seventy-five cents. I ask these questions of our farmers, and the answers I get remind me of one made by an old gentleman, who was very set in his own opinions. A teamster, passing his house one very cold day, said, "Uncle, this is an awful cold day." "Yes," the old gentleman said, "it is the coldest day I ever saw." The next day was warmer, and the teamster again saluted the old man, saying, "It is not as cold to-day as yesterday." The old man straightened up and answered promptly, saying, "It is not a bit warmer, but perhaps it isn't quite as cold."

When I ask, what makes you keep cows that do not pay you for the hay and grain fed, I get the answer, "We cannot afford to buy better." "We haven't the money; it takes money to farm it, as the Board of Agriculture tells us, and as the various experiment stations show by their experience," while at the same time they are losing money every day by the course they are pursuing.

I might ask the following questions:

"Why do many farmers keep right on pursuing extravagant and heedless ways of farming?"

"Why keep two hired men when a good outfit of machinery and a little more industry on the owner's part would make outside help unnecessary?"

"Why store farming tools in the fence corners instead of putting up a little shed for the machines and wagons?"

"Why half starve the cattle in winter because too neglectful to grow fodder corn in due season?"

"Why skin the farm with exhausting crops because too shortsighted and stingy to feed the land?"

"Why feed extra grain to keep the cattle warm when repairing the barns would answer the same purpose, and last for years?"

"Why spend so much time in repairing old tools and harnesses in working season, while the men look on and loaf and your crops spoil?"

I refrain lest you might retaliate, and ask me the same question "The Union" asked, "Why don't the party who wrote the above go to farming and make his fortune?" which, I am sorry to say, very few farmers are doing to-day.

Thanking you for your kind attention, and knowing that Brother Bachelder has not reversed the old rule, and is saving the best wine until the last, I will close lest I weary you all.

STRAWBERRY CULTURE.

GEORGE F. BEEDE, FREMONT.

I shall endeavor to give all the information I can in plain, clear language, so that even the boys and girls can raise this delicious fruit with success and profit.

Each one must decide for himself whether to engage in the business or not. A liberal supply of nice strawberries would add to the health and happiness of any family, and where there are opportunities, plenty of ground, and persons to do the light work required, no one ought to neglect to raise them.

When one becomes really interested in the work there is a fascination for it that cannot be resisted. The fever will come with every returning spring.

Young people and those of failing strength can earn more money by raising strawberries than in any other line of gardening; the work is light, to say nothing of the pleasure.

Aim to raise large crops, as the berries are always larger in size, finer color, and of better flavor when the crop is a good one. There is not much hard work about it, except the picking; here the fun of picking big berries of your own growing will lighten the burden. These large berries will sell for a higher price, and the market is never supplied. It is the small, poor colored, sour and dirty berries that overstock the market.

One great secret of raising strawberries is to do everything in season, neglect no detail, look after them every week and hoe at least twice a month in the growing season. I speak of it here, as this is the point where everybody makes a failure. If you clear out the beds in good shape the last of June, and in the press of other work do not go near the strawberry patch for three or four weeks you will find a mass of weeds, without any strawberry plants in sight; no future care can recover such neglect.

VARIETIES.

As much of the success of strawberry growing depends upon a wise selection of varieties, it ought to be the first question to be decided. I think it best to treat this part of the subject in a general way, instructing each one to make his own selections.

Strawberries are grown for home use, and for a near or distant market. There are varieties adapted to each of these uses. For home use select such varieties, only, as are described as of good, excellent, or best quality; fair quality always means poor quality; it is used in descriptions, as it sounds a little better, but it ought not to deceive any one. Varieties of *best* quality usually are poor bearers, or need the highest and most skillful culture to produce an average crop; poor quality and immense quantities usually go together, and these varieties will succeed and flourish with ordinary culture.

For near market firmness is not of much account; for distant markets this is the most important question.

Berries must be firm to ship long distances; also for canning, a berry should be firm, keeping its shape after cooking; also dark colored and red all through, with a rich strawberry flavor.

There is a limited use for strawberries for two other purposes, for exhibition and fancy market. "Large and handsome" win the prizes on the exhibition table.

By fancy market I don't mean any market that will pay from two to five cents per box extra for looks and size without any regard to quality. There is a fancy market very different from this. A market that pays from forty to sixty cents per box and so up, if the berries come up to the standard, which is: beauty of form, deep red, crimson, or scarlet color, bright and lasting, a glossy, varnished surface, and largest size must all be combined with a mild, sweet, delicious and exquisite flavor. Perfect specimens of Crawford, Belmont, Leader, or Marshall will fill the bill. I mention this, in part, to show the possibilities of the strawberry. No

one should commence on a large scale or attempt to raise fancy berries without experience. Try in a small way first: select varieties that do well and bear well with ordinary culture. With increased experience and skill, if the business is found profitable, the patch can be enlarged, and one can venture slowly with the fancy varieties, if a market opens for the sale of them at fancy prices.

Handsome looks add much to the value of any variety, even for the cheapest markets. If the berry pleases the eye, it will create the desire to eat it, to know if it will satisfy the taste as well as the eye. The color should be bright, and it is necessary for the color to last, hold bright, after picking; many otherwise desirable varieties have a faded or wilted appearance soon after picking; this is a serious defect, so is a white or green tip, also white flesh, especially if near the surface; strawberries will look mussy if the skin is broken; the same if the surface is soft; this should be glossy. Regular conical form is best, but any shape, excepting crooked and misshapen berries, looks well if uniform in size.

Size. The larger the better for market. A berry an inch in diameter is large enough, but the smallest berries of a variety must be this size or they will be too small in last pickings. Small berries sell cheaper, cost more to pick, and there is no profit or pleasure in raising them.

Firmness does not mean a green berry. The reason why "native berries" will sell for more money in any market is owing to their being fresh and ripe. A very soft variety often has to be picked green to enable it to get to market whole. Soft berries must be picked often, and when slightly colored, are sure to demoralize the pickers. If you direct berries to be picked slightly colored, there will be plenty of green ones in the boxes that must be thrown out. These points show the value of firmness in a variety.

Productiveness. After all that is said of varieties, unless they are productive in many different localities they are of no value for commercial purposes.

Unless people understand the possibilities of the strawberry in this direction they would be surprised to be told

that more strawberries can be and have been grown on an acre of ground than of potatoes, but such is the fact. I have looked up scores of reliable accounts. In ordinary field culture the range is 100 to 300 bushels per acre; with high culture 300 to 600 bushels per acre; small plots at the rate of 600 to 960 bushels per acre.

It does not necessarily follow, however, that the variety that yields the most berries, or even quarts, is the most profitable. The ready sale of fine fruit, at an increased price, must be taken into the account, and if you are a little sentimental, the satisfaction of the purchaser as well as the pleasure to yourself in handling the finest and best. The expense of raising and delivering is the same, and constant charges, the better price and ready sale, will often offset the increased yield of poor but productive varieties.

I do not propose to name any varieties, but a word or two in this direction will not be out of place. Select varieties that have an established reputation for the main crop.

I have not the "facility of language or the elasticity of conscience" to enable or induce me to attempt to describe a hundred different varieties all with the same superlative degree of praise and merit. All cannot be the largest size, the most brilliant color, the handsomest form, the most delicious flavor, of the greatest productiveness, with plants of unsurpassed vigor. Locations and conditions have so much influence upon the behavior of varieties that honest descriptions often appear to be in fault, or misleading, so I think it will be better for you to get your descriptions of varieties, especially the newer varieties, from the bulletins of the Experiment Stations. In regard to new introductions we must depend upon the catalogues. By using a little common sense, guided by more experience, you will be able to sift the true from the deceptive. Those points that are left out or passed over lightly are the weak points. Filling in the lines between the exaggerated and superlative language used in the descriptions, with points of defects suggested by what the description does not say, will often give a fair and correct mental picture of the variety in question.

The old proverb, "Try all things and hold fast that which is good," is a safe rule for varieties. A good rule in selecting old or new varieties is to take those only that have shown the best results in many different sections, rejecting those that appear to be variable or have exhibited weaknesses.

In testing new varieties on a small scale, it is of as great value to know what to avoid as to know what will be desirable and profitable for general planting. Reject all varieties of small size or poor quality, also those that show weakness of plant at any time or place.

There never was so great activity among growers to originate and introduce new seedlings. I know many berrymen who have fruited many thousands of seedlings, and have yet to introduce a new variety. Their ideal is so high for the different points of excellence, their consciences also being tender, it will not allow them to say anything but what they know is strictly true. These men might well consider that the ideal berry and plant, having all points in perfection, is more visionary than practical. It is easy to say what an ideal strawberry should be, but the seedlings don't seem to have much inclination to develop that way. I should say that the "ideal strawberry" must be adapted to all soils, color showy and lasting, firm, largest size, excellent flavor, perfect flowers, a strong, healthy grower, and very productive.

I suppose for the present we must content ourselves with individual traits of excellence, and to have in hope the production of the perfect variety for all soils, places, and purposes.

With one or two exceptions my rule has been to test each new variety personally before offering it to the public. There is less money in this course, but more lasting satisfaction.

Strawberries should not be regarded as mere luxuries, but a healthful as well as a delicious, refreshing, nourishing fruit.

Before passing to the cultivation of this noble fruit I want to put in one more plea in its favor. You get quick returns for your labor and care. It richly rewards you the first year

after planting. It will generously, that is many times, repay you for a little labor, and it will respond with increased returns for all the labor, care, and nursing that the most intelligent, liberal, and skillful grower can give it. You do not even have to wait till the last of autumn; the delicious fruit is ready to refresh you, to fill your pocket-book, at the beginning of the season.

It not only yields its fruits in great abundance, but gives a large and valuable increase of plants in addition to those needed for the most profitable fruiting.

To sum up, a good variety must be large size, with last pickings large, a bright, dark, rich, lasting color, the color extending to the center, the form regular and uniform in size, moderately firm, quality good or best, and productive to very productive.

LOCATION.

The strawberry will grow and flourish in every part of the United States. It will succeed better North than South. It is cold blooded, so to speak. Northern and eastern slopes are better than southern or western, unless the latter are protected from west winds; a sheltered place is best. Southern slopes should have the rows planted running north and south. I will remark here that space will not permit me to give all the reasons why this or that way is the best. Experience, sometimes dearly bought, has taught me that such are the facts, so I will give the facts without detailing all the reasons for them.

The ground should be free from the roots of living trees. The strawberry needs moisture in large quantities. The fruit often ripens in a dry season, and the yield would be greatly lessened, if roots of trees or other plants occupied the same ground. The interior towns and cities are the best markets. A good trade could be established near any village of fair size. The larger the place the better the market, excepting large central cities.

The location should be high, if possible, to escape late spring frosts. An eastern slope and sandy soil are most favorable for early berries. A northwestern slope and clayey loam, best for late berries.

For market the location must be of easy access, either by rail or wagon, also where good pickers are available. If you live within wagon distance of a good market try to raise fancy fruit for fancy prices. There will be no trouble about the market if you grow first-class fruit; the demand will keep ahead of the supply.

SOIL.

Any cool, rich and moist soil, when properly prepared, is suitable for strawberries. It may be clay, loam, muck, sand, or gravel; if too wet it must be drained before the strawberry plant will flourish. No soil is better than good drained land, as this insures proper moisture. The soil should be deep, as the root system is long, enabling the plants to flourish and mature their fruits in a dry season.

A fertile soil is better than artificially supplying a great amount of fertility at one time. I prefer a soil planted at least two years before setting the strawberry plants; you get rid of many weeds, grass, and the white grub worm that is so ruinous to the young plants just set. You also have a chance to heavily manure the land for previous crops, which decomposes the manure, fitting it for the minute roots of the strawberry plants, also making the elements of fertility immediately available for plant growth.

MANURES.

Stable manure is the best; if partly decomposed, plow in; if thoroughly rotted, spread on the surface and harrow in. If stable manure is scarce or lacking, fertilizers can be used with success. My first choice is fine ground bone and unleached wood ashes. When you apply these you know what you have, and they are reliable.

Commercial fertilizers are most profitable on rich garden soils, and fields either heavily manured or containing a large amount of vegetable matter. I would not recommend them alone for field culture where much fertilizer is needed. I fancy the roots of the strawberry plants want a good, deep, friable bed to lie in as well as plenty of rich food to eat. Plenty of decomposed manure and vegetable matter thoroughly mixed with the soil will give the good bed; the ashes and bone facilitate the decomposition of the manure, and add more variety to the food. In using commercial fertilizers three elements only are needed, nitrogen, phosphoric acid, and potash. For those who wish to experiment, and for those who must have some additional fertilizers, I here append the following table of fertilizers recommended for the strawberry, being the results of careful experiments by the New York Experiment Station, Bulletin No. 94, New Series:

For Nitrogen,
- (1) 150 to 300 lbs. nitrate of soda, applied during the growing season; or
- (2) 125 to 250 lbs. sulphate of ammonia; or
- (3) 250 to 500 lbs. dried blood.

Phosphoric Acid,
- (1) 550 to 1,100 lbs. bone meal; or
- (2) 375 to 750 lbs. dissolved bone; or
- (3) 450 to 900 lbs. dissolved rock.

Potash,
- (1) 140 to 280 lbs. muriate; or
- (2) 140 to 280 lbs. sulphate; or
- (3) 550 to 1,100 lbs. kainit; or
- (4) 1,400 to 2,800 lbs. wood ashes.

GETTING READY.

A fine location, a cool, rich, moist soil, and plenty of fertilizers without proper preparation of the soil and manure would be useless. To say "properly prepared" does not give any information. I can only give my methods, and as I have had a measure of success, I do not hesitate to recommend them. The field is open; others can improve upon them as much as their intelligence suggests and means allow. I am writing more particularly for the novice just commencing the business.

To start with you want to enrich your land, eliminate, destroy all the weeds, insects, and worms that you possibly can; this includes witch grass and all perennial weeds. I break up the sod in the spring, plant corn, spreading the manure on the surface, harrowing it in. Late in the fall plow and leave the furrows rough. In the spring plow in a liberal amount of manure and plant corn. Late in the fall plow and leave the furrows rough, turning in a good amount of manure. In the spring harrow the ground thoroughly, at least four times, float it and plow; if you have plenty of decomposed manure, apply a liberal amount, and thoroughly harrow in. If not ready for plant setting harrow again and float (level off) when ready. Spread the ashes and bone soon after setting the plants. If I were obliged to depend upon commercial fertilizers I should spread a portion of the quantity to be used before plowing in the spring, spread more fertilizer, and harrow in; apply the remainder after plant setting and cultivate thoroughly.

PLANTS.

The best plants are of medium size, grown on your own ground; if you haven't them, buy of your nearest neighbor who has them to sell. If you send to a distance for plants, select some one who you *positively know* will dig them fresh and pack with plenty of damp moss before the roots dry out, one that ties twenty-five plants in a bunch, and puts moss around every bunch; if this is not done the plants are likely to heat and lose their vitality; also some one who can count a hundred, and throw in a few for accidents. Take up plants with a small sized potato digger; never use trowel or spade. Feeble plants are not worth setting; throw them away.

Plants received by mail or express from a distance should be opened at once; separate each plant in the bunches and dip in water. If the ground is not ready for them spread out the roots, setting carefully in the ground, heeling in style, with the crowns even with the top of the soil, pack quite

closely together, firm the soil well over the roots, mulch with hay or straw for a few days. If there is any danger of the roots drying out water freely.

Plants should be trimmed, removing all dead leaves and runners, and for spring setting clip the roots. This is not extra labor, as it will save valuable time when setting the plants. Plants if dug a day or two before setting should be kept in a cool place, protected from the air, and the roots kept moist. In setting use half-bushel market baskets and moss to keep the roots moist and shaded from the sun if the weather be fair.

PROVIDE PLENTY OF POLLEN.

All strawberry growers are aware of the sexual character of the strawberry blossom. Space will not permit me to go into a minute discussion of this interesting question. For the information of the beginner I will briefly say: that some varieties are bi-sexual, perfect flowering, and will perfect fruit set alone. They have pistils which develop the fruit and carry their own pollen to impregnate or fertilize them, and are usually called staminate varieties. This is not technically true, as pure staminate varieties are destitute of pistils, and would not produce fruit. Pure pistillate varieties contain no pollen in the blossoms, are imperfect flowering, and require the aid of a staminate variety before they will produce fruit.

Some varieties have more or less stamens which are partially developed. The pollen is weakened and insufficient to fertilize the pistils perfectly; when set alone the result is partially developed or nubby fruit. The same result may be caused by not setting a full supply of staminate varieties, or continued wet weather when the plants are in blossom. Varieties of the largest size and of the best quality are generally bi-sexual. The most productive market varieties are generally pistillate varieties, are all medium in quality, and inclined to softness of berry. Some growers claim that the

production of pollen is more exhausting than the production of berries, consequently those varieties that produce both pollen and pistils are less productive. This is a mooted question; the arguments are hair-splitting. In the palmy days of the old Wilson there was some apparent truth in the theory, but the whole argument seems to be a failure since the introduction of Clyde and Wm. Belt. The best results are obtained by planting one third or one fourth of the patch, whether small or large in size, with staminate varieties, when the main crop is pistillate varieties. I have always fancied that two or more varieties will bear better than one variety set alone, even if it is a strong staminate variety. Now we have the ground and plants ready for

SETTING THE PLANTS.

The best time is early in the spring, though they will do well set as late as the first of June. It is always better to set *now than later* up to the middle of June. The first question that comes up is: What shall be the distance apart? The answer is: How are they to be trained, hill culture, narrow row or matted row? Hill culture is adapted to the garden, and requires constant care to keep the runners cut; you are rewarded for all patience and care bestowed by the largest and finest berries to be grown from spring setting of plants.

The narrow rows should be two and one half feet apart for the garden and three feet apart for field culture; plants to be set three feet apart in the rows; place the first runners in line with the rows to make a continuous row with plants six to eight inches apart in the rows. After the rows are full all runners should be cut as in hill culture.

For matted rows, the best and common method, both for garden and field, the distance that suits me is rows four feet apart and plants fifteen inches to two feet apart in the rows according to the vigor of the variety planted. I set by line, either direct under the line, or mark with small hand garden plow by line. If I use the line there are knots tied on the line the distance apart wanted for setting the plants; if the

rows are marked out, I use a lath cut the right distance for the plants.

For setting I use a short handled hoe of right size and shape. Place the plant in the left hand, spreading the roots like an open fan, insert the hoe at the point where the plant is to be set with a sloping cut; bring the top of the hoe towards you two inches, place the plant carefully with crown even with the top of the soil, remove the hoe and firm the soil well about the roots; graduate the pressure as the soil is dry or moist. The dryer the soil the firmer it should be pressed against the roots. Set plants in a cloudy day if possible; if fair, late in the afternoon. Do not drop plants ahead, set directly from the basket.

This method is easy, requiring few motions, and one can work a long day without getting tired. Another advantage, plants are set directly into the moist soil, and seldom require watering when set in the spring. Some growers prefer to mark the rows with a small one-horse plow, and set against the edge of the furrow, leveling the ground soon after setting the plants.

SUMMER PLANTING.

I have not had any success with fall planting, say later than the 10th of August. It is possible to set strawberry plants in July and the first half of August and get finer, better colored, and larger berries than can be grown by spring setting. There will not be as large a quantity by one third or one half, but the cost of cultivation is less, and two crops can be grown on the land the same season. Plants should be especiallly grown for this purpose, either by cutting off the fruit in old beds, or by setting very early in the spring closely in the rows, so there will be plenty of young, thrifty plants on a small space of ground, and later rooted plants can be used for next spring setting, or allowed to bear fruit. These beds are more properly called propagating beds. If you use selected, vigorous plants you will have as good "Pedigree plants," so-called, as you can buy.

The ground for summer setting should be more compact and richer than for spring setting. If lately plowed, allow time for it to settle before setting plants. Plants should be watered when set, unless the ground is very moist. They should be shaded from the sun for a few days. For a few plants I take long boards ten inches to a foot wide, and set on short pieces of joist five to six inches wide set on edge. This plan gives shade and free circulation of air. After the plants are established, remove the boards on a cloudy day or just before a rain. For larger plantations shade with a light mulch of straw or hay, or use green clippings from the lawn: these will give shade and dry out without removing. Dry hay or straw must be removed as soon as the plants are established. Shade also can be given with old strawberry boxes. Summer setting should be closer together, set ten or twelve inches apart in the rows, which should be four feet apart: set a row of plants nine to ten inches from the row first set on each side, quincunx arrangement of fives in a square. Plants for this method should not be over large, say three to five weeks old. I prefer these layer plants to potted plants. I would not accept potted plants as a gift for my own setting if I could not shake the dirt out, shorten the roots and set as a layer plant. If the roots have struck the sides of the pot and begun to whirl, they will continue on a whirl, in my soil, taking very little hold on the soil, and will prove a failure. Growers like to sell potted plants, and people like to buy them, and set them, because it is less trouble and they will live, even if they don't bear, without much care. No potted plants for me. Runners must be cut from summer set plants to get best results.

If the weather should be dry and you raise your own plants, you can take advantage of a wet or cloudy day and transplant, taking up the plants with a trowel with the dirt adhering to the roots, and set immediately. I always fill vacancies in this way that sometimes will occur in spring-set plantations, thus keeping full rows and a perfect stand of plants.

To my own testimony as to the best method of summer planting, I take the liberty to add that three of the best amateur growers of my knowledge practice this method, to wit: J. F. Beaver, of Dayton, Ohio, Mr. E. C. Davis, of Northampton, Mass., and Mr. Benjamin M. Smith, of Beverly, Mass., and it is with the greatest pleasure that I name Mr. Varnum Frost, of Belmont, Mass. He has repeatedly told me that he grows his largest and finest strawberries from plants set in July and up to August 20. It is well known that Mr. Frost's berries sell in Boston market at the uniform price of sixty cents per quart. It is also the method of Ezra Bell, the most successful grower of fine berries for Philadelphia market. Mr. Henry Jerolaman, who largely supplies the fancy trade of New York City, follows the same methods. These berries in their respective markets have long been famous for size, handsome appearance, and finest quality.

I do not wish to be misunderstood. Early spring is *the best* time to set strawberry plants. If for any reason, you do not set them at that time, they can be successfully set up to the first of June, the earlier the better. Also by setting young plants, grown especially for the purpose, you can succeed in summer setting from July 1 to August 10 for New Hampshire location. I do not advise later setting.

CULTIVATION.

As far as rules are applicable, it would be saving of labor to "never let the weeds get a start"; again, "treat late runners as weeds." It requires hand work as well as brain work to grow strawberries successfully. Those that are born tired, and have no genuine love for the work and for the fruit after it is grown, should not engage in the business.

Start the cultivator soon after setting the plants. Use a Diamond or Knife Teeth cultivator; these go "right to the spot," thoroughly pulverizing the soil and leaving it level. Cultivate for a month or six weeks as often as once a week, and hand hoe every two weeks. This will be the cheapest

way in the end, as it is easier and cheaper to kill the weeds when they are small. All strong weeds and grass that escape the cultivator should be gathered in heaps or baskets, and at once removed from the ground. It is a good plan when cleaning out the rows late in the season to throw the weeds into baskets as you progress in the work; this saves handling twice. Weeds of any size, if left on the ground, are sure to catch in and grow, which makes an additional expense.

Absolutely clean cultivation must be the ideal, both in theory and practice. You cannot get best results without it.

TRAINING.

Place the first runners in line to complete the row; fill in at least two plants between the plants set out. Spread later runners as they appear, equally on each side of the row. After rains loosen the soil so the runners can root freely; if needful place a small stone near the plant, on the runner, to keep it in place, especially where the plants are exposed to the wind. About the middle of September, when the matted rows are two and one half feet wide or more, hoe out a path eighteen inches wide in the center between the rows, and keep this path clear of runners. This is a much cheaper and better way than to allow the paths to fill up, exhausting the plants first rooted, and increasing the labor of clearing the paths later in the season. The fruit is much larger and finer if the vines are trained by this system, and very little fruit is destroyed by stepping upon it when picked. In full matted beds without paths, careless pickers will make new tracks at each picking. After three or four such pickings, the beds are a sorry looking sight; a mass of trodden vines.

The lesson should be learned early that every plant needs plenty of room to develop and form fruit buds. Many growers recommend to cut the runners on newly set plants up to the first of July. This is all wrong for fruit. The first plant rooted will throw out the strongest and most vigorous runners. By cutting off first runners you lose a month's time in the best part of the growing season. Get the matted

rows, two and one half feet wide, full as soon as possible; keep them of that width, removing all runners and later rooted plants that may appear in the matted row. The ideal row is thin-matted, plants four to six inches apart. These instructions are for raising fruit; to grow plants for sale is altogether a different thing. Those who want them for this purpose know how to raise them. If the fruit grower wants plants for his own use he can allow a part of the paths to fill up with plants to be removed in the spring when wanted for setting. My aim is to give the best and full instructions for raising fruit, fine fruit, and plenty of it.

I am inclined to think that what is best for the field is also best for the garden, so will not advise the beginner to try any notional methods, however well recommended.

The plants which are set in the spring should not bear any fruit the first season; prevent this by picking off the blossoms. You weaken the newly set plants very much by allowing fruit to mature; it is small and dirty and doesn't amount to much.

Some very successful growers pull up the old plants set in the spring, with all slightly rooted runners, for a path. This should be done as early as the middle of September. This method is more particularly adapted to growing fancy fruit. The old plants and late rooted plants will bear fruit of smaller size, poorer color and flavor. By this method or the thin matted-row system above described, the earlier in the season you get the first, second, and third plants from the parent plant rooted, the larger and finer will be the crop of berries.

Fine fruit can be grown with plants in hills or in narrow stooled rows, keeping all runners cut. The above methods will give fruit as good, for ordinary use or market, more to the acre, and at less cost.

Strawberries are social and like company; do better shaded somewhat from the sun; are larger, better colored and hold out longer. These conditions are best obtained in thin matted rows.

There is no gain in cultivating with a horse after your matted rows are full width. The horse is likely to step on the plants, the cultivator injures many more, and the ground gets packed too solid for the good of the plants. Substitute for the horse and horse cultivator a Little Gem hand cultivator. It will do the work thoroughly and fast.

MULCHING

is necessary at the North, and especially on heavy soils, for winter protection. The strawberry plant is generally hardy and will stand any degree of cold without harm. Mulching prevents the plants being drawn up by the frost, disturbing and breaking the roots.

If left on late in the spring it protects the blossoms from frost, and retards ripening. It should be raked between the rows, keeping down weeds, and the fruit from sand and dirt.

When the ground freezes in the fall, cover between the rows, and lightly over the plants, with straw, old meadow hay, pine needles, or evergreen brush, and where it can be had salt hay is one of the best of materials for mulching. If light hay is used, something must be laid upon it to keep it in place; if brush is used, it must be removed in the spring.

Beds trained in the hill system, either in the field or garden, also summer set plantings, should have more covering than matted rows, and it must be applied early. Strawy stable manure that has been once handled, to destroy the seeds of weeds, would be an excellent mulch to cover the ground between plants set in the summer. This could be put on any time in the fall, before late rains, if possible, and cover the plants later with some light material to avoid smothering them.

SPRING CULTIVATION.

If any weeds, grass, or sorrel are in sight when the plants are uncovered in the spring, remove carefully. If a hoe is used, run it lightly, as it is a damage to stir the soil to any great depth before fruiting.

PICKING AND MARKETING.

Have careful pickers; pick often; as soon as the fruit is well colored, in the coolest part of the day. Grade the fruit, handling as little as possible. If it averages large size, remove all green and soft berries and long stems that may accidentally find their way into the boxes. Pack at once, keep in a cool place, and market as early as possible. Each picker should have a stand holding six boxes. Some use a cloth tacked to the handle to shade full boxes as they are picked. Use new boxes, full size, and clean crates; shake down gently when half full, and fill boxes so they will be well rounded when they get to market. Handle the fruit in every way so that your customers will want your fruit year after year. Avoid sending fruit to market when heated or wet; it is sure to arrive in bad shape.

Large sized fruit of good color and quality, fairly firm, well put up, will never glut the market; the supply will never meet the demand. Use the same care in keeping up a reputation for good and fancy fruit, as was exercised in building up the trade, and there will be no difficulty in selling all the fruit you can raise. There are many cities and more villages in New England where the first box of first-class, fancy strawberries has not been offered for sale.

RENEWING OLD BEDS.

I approach this question with a good deal of delicacy, as it is a question of much controversy. I have experimented much on this line, and if I say anything I must give the facts as they appear from the tests I have made. In garden culture, with four-foot beds and three rows of plants to a bed, trained hill system, the beds can be allowed to bear three years with profit. Old beds will fruit earlier. Many varieties bear more freely the second year. The fruit is smaller in size, and for this reason less profitable. Growers of fancy fruit invariably fruit only one season. Old beds *can be renewed* at less expense than setting and cultivating new beds, though this might not always prove true. I have tried mow-

ing and burning. If done just right, it is a grand success, but if there is too much heat, it will kill the plants; if too little, it will not kill the weeds, so I find this method too risky.

The past season I hit upon a simple, easy, and cheap method that promises fair for great results. I never saw such fine looking beds for a second crop as I had last fall. The theory has been that the old beds ought to rest a month, after fruiting, before they are disturbed. This would do better if the grass and weeds would rest at the same time. They don't do that way here.

As soon as we finished picking the fruit, about the 20th of July, we took a common field cultivator, removed the two rear teeth, and cultivated all the paths between the matted rows, destroying millions of weeds and plants. This was continued once a week at least six weeks. Pull all weeds that show above the vines, and carefully hoe out all that are in sight, too small to pull. This can be done when other work is not pressing, any time before the first of September. The beds need very little care after this date, if previous work has been thorough.

In our northern climate old beds cannot be renewed by leaving a center row of old plants, expecting to get new plants from runners to make a new and full matted row. The plants start too slowly, and are not vigorous enough for this method, and you must depend upon the old plants for fruit. Renovate and push these so they will form plenty of fruit buds for a good crop of berries.

To sum up: If your plants are used up after fruiting, or if your beds are full of weeds, grass, or sorrel, showing less plants than rubbish, plow up at once, as soon as picking is over, and plant some other crop. If the plants are strong and vigorous, or are of those varieties that bear freely the second season, run them another year. Use your judgment. After you decide in either case, act promptly, and your second crop, either of turnips or barley fodder in the fall, or strawberries next season, will be more profitable.

I have not seen for a long time so much condensed information on strawberry culture as I find in the summaries of the Strawberry Bulletins of the states of Ohio and New Hampshire for the year 1897. Any person interested can write to the stations, and get these valuable pamphlets free. There is full information in each on strawberry culture, with lists of the best varieties, old and new, without exaggerated and superlative descriptions.

DRAINAGE.

W. H. CHILD, CORNISH.

This subject is one that has long been neglected, and is generally regarded as comparatively unimportant. But few through this section of country have ventured to undertake it, perhaps because they are confronted at the outset by the prospect of hard labor, attended with more or less expense, and the chronic growler against agricultural advancement says that "land is too plenty and cheap to warrant any such expenditure upon it," and so any projected plan in this direction is abandoned.

Now we propose to show that there is no better paying investment, no project that yields such immense returns among farmers as tile drainage, when judiciously performed. What we have to say is no read-up theory, no system formulated from the opinions of others, but rather the results of a rigid experience during the past twelve years on our own farm, and on some adjoining farms. The results of our first trial far exceeded our expectations, and each trial since then has been attended with equal success. These results have been truly wonderful, and very naturally arouse in us a good degree of enthusiasm on the subject, and to awaken a degree of the same among my brother farmers is the purpose of this article, or treatise.

Let us in the first place consider the extent of its territorial importance. There are in nearly every town of our state, hundreds, if not thousands, of acres that to-day are yielding but a tithe of income to their owners that they would be capable of yielding, were the conditions rendered favorable by the removal of the superabundant water. These lands are not only unprofitable but unsightly, and in many cases positively unhealthy. A considerable portion of this land is of no value whatever in its present condition, being marshy, wet, boggy territory of no use except, as the saying

goes, of "holding the world together." Thus we see that in the aggregate there are hundreds of thousands of acres of such land in the state of New Hampshire that the farmers are paying taxes upon that, in his present inert and undeveloped condition, are of no account. Now we claim, and think we can prove that these lands, in most cases, may be rendered immensely profitable to their owners, yielding from twenty to sixty (or more) dollars per acre every year for all time to come, or as long as any of us may need it. What an aggregate of wealth might be added to our own state, to say nothing of similar lands outside! What a charm also would be added to the landscape were these unsightly places converted into luxuriant meadows crowned with a great abundance of beautiful vegetation! This may sound like a breeze wafted from fairy-land, but, nevertheless, it may all be rendered true, for such has been our own experience. Any one owning such land may verify it to the full degree if they choose to do so, and are willing to incur the expense of money and labor to perform it as it ought to be done. We would again emphasize the fact that whatsoever the expense may be, it is once for all time, if properly done; not like the building of wooden fences and shingling of buildings, that needs to be repeated every few years, but once done, always done. There is no enterprise that illustrates the truth of the saying, "What is worth doing is worth doing well," more than tiling these lands, and equally true is it that there is no undertaking so liable to be slighted and left incomplete as this.

The subject of farm abandonment is more closely related to the subject of drainage than is usually thought. As the father has done, so the son will do. Settled on the hillsides, cultivating them year after year, and generation after generation, these lands become exhausted, and finally their owners become discontented, and the cry of "farming don't pay" is raised, the farm is abandoned, and the young generations either go to the cities or to the more alluvial soil of the West. Little do they think that in many cases they are leaving a

better soil behind them than is found on the river bottoms of the West, and greater mines of wealth than the cities can afford them. Little do they think that that swaly marsh on their old homestead, which for centuries had been accumulating its wealth from those now barren hillsides, possessed elements of real wealth worth securing! But this is the fact. These swales are the depositories of the wealth of our farms. For untold centuries, these have been accumulating the choicest elements of fertility, and only need the bold hand of industry to unlock them for our use. Dame Nature is rich. These are her pockets. She is willing and desirous for us farmers to open them and help ourselves; and as her representative we urge you to accept of her invitation.

Too much water is a curse to vegetation. Colonel Waring says: "If a rule for drainage could be adopted which would cover all the varied circumstances of different soils, it would be somewhat as follows: All lands of whatever texture or kind, in which the spaces between the particles of soil are filled with water, whether from springs or rains, within less than four feet of the surface of the ground, except during and immediately after heavy rains, require draining."

On the class of lands heretofore mentioned, the water level and the soil surface are about the same point. In wet seasons or times, the water rises a little above this point, and in dry seasons or times, the water falls a little below it, but such soil is always saturated with water. No air can penetrate into it. It is always cold, as the heat of the sun can change it but a little. No vegetation of value can grow upon it, for the roots of such never will penetrate into it, hence, nothing will grow there except worthless water grasses or flags, or at best, a very inferior quality of grass that possesses but little nutriment or sweetness.

Now let us pass some drains through this land, and drop the water from two to four feet below its former point, and what a transformation takes place! The muddy, soppy soil becomes dry, or sufficiently so for every purpose. Teams can now be driven over it, heavily loaded if need be. The

plow may now be used, and a rich, black mould is turned up, unlike any other soil. It is entirely free from all upland weeds. It pulverizes readily; is lighter to work than any upland soil; is readily prepared for any crop desired. Corn, potatoes, grain, grass, fruit, all kinds of garden truck, in fact, anything may now be put upon it with a reasonable certainty of success. And such a growth! It reminds us of the fairy-land where the magic wand has been wielded, and of Eden's bloom where beauty prevails. The roots of all plants penetrate deep into this soil, where they just luxuriate "like pigs in clover." As the water has settled far below the surface, the air follows down through the passages vacated by the water, and the heat accompanying the air, the soil becomes sufficiently dry and warm. In this way the soil becomes prepared for all vegetable growth.

Our own experience with tile draining began in the autumn of 1886. Each year previous to this, about twenty-five acres of wet, boggy land was hayed just for "looks sake," as it yielded no profit of account above the expense of harvesting. As a matter of trial and experiment, we purchased tile sufficient to drain about one acre, at an expense of about $35, laying the drains twenty-four feet apart. The trial, proving entirely satisfactory and successful, has encouraged us to continue the work nearly every year since with unfailing good results. Each acre thus improved has not failed to yield an increase of at least twenty dollars each year above the expense of harvesting, while most of it has yielded far in excess of that. The finest fields of corn, potatoes, onions, celery, etc., ever seen in the section have been easily raised; while three tons of fine English hay per acre is no uncommon yield from this land.

The necessary limitations of this paper will not allow us to give directions about surveying the land, ascertaining the "fall," laying out of the ditches, describing the process of construction, and the laying and covering of the tile. These are all vital points, and should be well understood before embarking in the enterprise. We would therefore advise any

proposing such an undertaking to take counsel, covering all these and many other points, before they begin, so as to start right.

We will now speak of some of the advantages of tile draining besides those already mentioned:

First. The seasons are made longer. In our latitude and climate the seasons are so short that the farmer is often troubled to find time to grow and mature his crops before the frosts of autumn make their appearance to injure and destroy; and so he is anxious to improve the earliest opportunity to get the crops started in the spring. The waters of spring passing off so rapidly by means of the tile, leave the land dry and warm nearly two weeks earlier than it would otherwise be left. The frosts of autumn do not come on a warm soil as soon as on a cold, wet one; so the season is practically lengthened about three weeks.

Second. The land is worked sooner after rains. This is apparent to all, that the sooner the water settles and passes into the tile and runs off, the sooner the land can be stirred. In open ditches the water moves much slower, because hindered by grass and other obstructions. The stream being spread wider in the open ditch, encounters these obstructions to such an extent that the water is a long time in passing off. In stone drains the same objection prevails to some extent. The ragged interiors of stone drains cause the water to move slowly, and obstructions gradually accumulate, and, after a time, they become choked or filled up, and therefore useless. Yet where stones are abundant, and the farmer wishes to remove them forever from his sight, it is a very convenient way to dispose of them, and get at least a temporary advantage from them in the way of drainage. But with tile the water is rapidly spouted off, leaving the land dry and the crops unharmed.

Third. The hay crop is always assured. It is a well known fact that the quantity of the hay crop grown on hill sides and upland is very largely dependent upon the amount of rainfall; that if the rainfall is light, as in 1896, the crop

of hay will be light; or if it be abundant, as in 1897, the crop from such lands will be heavy. But land properly tiled does not get too dry; there is just the right amount of moisture—no lack: and the wet season is scarcely too wet for it. The quantities of hay on our tiled land in the two years named were about equal. So an abundant hay crop on such land is practically assured, regardless of all ordinary conditions of moisture. The same is practically true regarding all other crops.

Fourth. A lovely soil for working. There is usually a greater or less amount of vegetable mould deposited on the land needing drainage. This, when dried and rotted, becomes light and easy to work. It is also free from the foul seed so common on upland fields. Thus more pleasure is derived from working such soil, as well as in handling much heavier crops from it.

Fifth. Closed drains conserve; open ones promote loss. With closed drains the fertility of the farm is saved to be again utilized. With open drains it is otherwise. In high water in spring time, and after heavy rains, the wash from the hillsides, from the farm buildings, and from other sources of fertility, passes into the open drains, flowing off into the brooks, thence to the rivers, etc., and so is a total loss to the farm forever. With tile drains nearly all this fertility is preserved on the land. The soil on tiled land has become a great filter, and the water percolates down through it to the tile, and passes off as pure water, leaving all the sediment on the surface for the benefit of vegetation. Water from a thoroughly drained field is always pure, and of the best quality for man or beast.

Sixth. If soil is well drained the heat absorbed increases the temperature from eight to fifteen degrees. This is very essential to the germination of all kinds of grain, and especially of corn. This will germinate at fifty-five degrees, while at forty-five degrees it will rot in the ground.

Thus we see that by judicious and thorough drainage, the business of farming is elevated from one of uncertain and meagre profits to one of absolute, certain, and lucrative profit.

With all the advantages we have named, and many more we might name, we may well ask: Why is it that the subject receives so little attention among our farmers? Why continue in the old rut, and cultivate the same fields our fathers cultivated, and run the same course our fathers have run? Why will the money-loving Yankee farmer, usually so shrewd about acquiring a dollar from almost any source, overlook an investment that will pay him better than any other? Why will he allow these waste places to stare him in the face all his lifetime, increasing his labors and lessening his profits?

We will not ask an answer, but only urge each one to consult with themselves, and each other, and try the experiment as we did in 1886.

In closing, we would return to a thought advanced near the opening of this paper, and emphasize the same. I refer to the changing of the unsightly, unhealthy, and unprofitable tracts of land to those of beauty, health, and profit. This is no chimera, no delusion, but a matter that I have fully realized in my own experience, and which my townsmen and neighbors can verify.

If there is a material mission on earth pre-eminently noble for man to perform, it is in promoting the welfare and happiness of his brother man; and in no way can this be accomplished better and more effectually than by inducing him to remove all causes of ill health, and to incite him to render beautiful that part of God's heritage he calls his farm, and to so apply the arts of intelligent, honest industry, that his profits may be increased many fold, and his entire farm become a thing of beauty which shall be a joy forever.

POULTRY ON THE FARM.

GEORGE H. WADLEIGH, TILTON.

One egg is a small object, and likely to arouse in the novice but little interest from a financial standpoint, but when we consider the magnitude of the poultry industry in the United States, we find it takes high rank among the lucrative branches of farming. From leading agricultural papers we make extracts:

"It is probable that the annual product of the poultry industry, the meat and eggs consumed, represents almost as much money to the producer as the wheat crop."

"The value of fowls alone is to-day three or four times the total value of all the sheep in the United States. Even the hogs now in this country represent no greater value than the poultry, and dairy cows are valued at only double the poultry figures, eggs excluded."

"In 1890 there were in this country 258 million chickens, the average value of the chickens was thirty cents each. The American hen laid in that year 819 million dozens of eggs at an average value of fifteen cents a dozen. If the increase in the past seven years has been proportionate with increase between 1880 and 1890 there were in 1897 360,000,000 chickens, and the hens laid in that year 1,110,000,000 dozens of eggs. We estimate the value of these at $170,000,000, and poultry sold as meat $130,000,000, or a total of $300,000,000, as the earnings of poultry in one year. American poultry earned enough in one year to buy all the silver and gold dug out of the mines, all the sheep in the country, and all the wool they made, and in addition the total crops for the year of buckwheat, rye, barley, and potatoes. This year's earnings of poultry would have bought all the milch cows in the country."

"Up to the present, the production of poultry yards is all wanted at home, while it is a noteworthy fact that millions of dozens of eggs are imported annually, the home supply

falling short of the market requirements. Besides our home market there is a wide foreign market for eggs. England and Germany do not produce sixty per cent of the eggs they consume. During 1895 the United Kingdom imported daily an average of 4,000,000 dozen eggs, or paid out nearly $50,000 for eggs each day. In 1894 Germany's egg imports exceeded her exports by 78,575 tons; over $14,000,000 were paid out by her for foreign eggs. The United States sends her wheat and other grains to Europe, sells them in competition with grain from Russia, India, and South America, and leaves the egg trade of Europe to other countries. While the transportation of a dollar's worth of potatoes 1,000 miles costs us forty cents, and one dollar's worth of wheat twenty cents, one dollar's worth of eggs may be shipped the same distance for eight cents. Yet inferior, unimproved stock constitute the bulk of our 383 million fowls, and hardly ten per cent are managed after the most intelligent methods."

The question at once arises: What breed of poultry is most profitable for the farmer? This depends on the surroundings, available markets, the aims, and also personal fancy of the individual. The number of excellent breeds, each adapted to its own purpose, whether egg production or meat in the form of broilers or full-grown fowls, is sufficiently large to satisfy any reasonable person. Any further effort in the way of originating new varieties is uncalled for.

Whenever an attempt is made to improve on an established breed by crossing or mixing breeds, one is sure to be disappointed by the result. I speak from experience on this point. Thorough-bred fowls are by all odds the most satisfactory. One who intends to enter the poultry business, either in a large or small way, should first decide which he can produce most profitably, eggs or poultry for market. This settled, he can select the breed adapted to his purpose.

We now call your attention to some of the leading breeds:

The Minorcas, of which there are two varieties, white and black, are prolific layers of large white eggs. They are hardy and of large size, and having a light skin are superior as an

article of food. A warm house is necessary for them, as they suffer from the cold more than many breeds.

The Hamburgs are also excellent layers of rather small eggs, produced mostly in summer and fall. They are very attractive, a pen of these birds presenting a very pleasing appearance. As they are rose-combed, there is no trouble from freezing, and with reasonable care they will give their owner a good return.

The Leghorn is another egg-producing breed. In my opinion they excel. The white and the buff lay a larger egg than Hamburgs or Minorcas, and they are very hardy. They are all-the-year-round layers, making an excellent showing each season. They develop rapidly, weighing three pounds when dressed, at an earlier age than any other breed, and having a clear yellow skin, are desirable for table use.

Cockerels of the larger strains will weigh six and one half pounds, live weight, and pullets five pounds.

The brown Leghorns are excellent layers of smaller eggs, are very pretty when bred to the standard, but are not so desirable for meat on account of smaller size and dark feathers.

Plymouth Rocks and Wyandottes have many points in their favor, both in respect to egg production and as dressed poultry.

The barred Plymouth Rocks are found in more yards than any other breed. They are fair layers of dark eggs, and are good sitters and mothers. The chief objection to them is their inclination to take on fat when over a year old. I have been especially pleased with the white Rocks, as they have all the good points of the older variety, and because of their white plumage are preferable for dressing. The buff Plymouth Rocks are a new variety, and are well recommended, but are not yet established, so as to breed to a feather—this may be said of all the buffs.

There are four varieties of Wyandottes, silver laced, white, buff, and golden. They are all rapid growers, mature early, are good layers, and superior for table use.

I have received better returns from the golden variety than from the others. They are a handsome bird, produce an abundance of dark eggs, and are good mothers.

Among the Asiatics are Brahmas, Cochins, and Langshans. These are all large birds, fine for dressing when mature. This requires a longer time than in case of American breeds, and consequently at a greater cost.

Whichever breed you select, be sure it is adapted to your purpose. Visit poultry yards whenever practicable. Read a good poultry journal, and compare the experiences of poultry keepers. Do not attempt too much at first. A flock of twenty-five thorough-bred fowls will give far better satisfaction than any number of a mixed breed. When one has learned to manage a small number successfully he can gradually increase his flock, although it is much easier to succeed with twenty-five or fifty than with a larger number.

When one has reached the limit of fifty fowls, conditions change. Before there was probably unlimited range; now, confinement, with only short runs, begins; unless careful attention is given a change for the worse is soon apparent.

For a test, let the prospective large-plant poultry breeder try three pens of fowls in confinement for a season. There should be about fifteen in a pen 10x12 feet, with a run 10x50, or better 10x100. The cause of failure in a majority of instances is over-crowding. If he succeeds with these, he may safely increase the number.

This leads us to speak of the size and construction of houses for poultry. The house should be warm, dry, and well ventilated. The roof may be single or double, although we favor the double roof. It should be well boarded, papered, and shingled, and the sides papered, clapboarded, and painted. The building should be twelve feet wide, with windows facing the south, at intervals of two feet. It should be divided into pens of ten feet by screen, or inexpensive boarding; each division lighted by two windows, the lower sills of which should extend within eight inches of the floor.

Such a building will cost about $2.25 per foot in length,

or $225 for a house 100 feet long by 12 feet wide. Some will declare that the number of windows is too many, that the house will be made cold. It will not be cold if the windows are properly put in. It is very important that there be plenty of opportunity for light and sunshine. Many fail at this point.

I will give a bit of my experience. In my first building were two pens with only one window in each, about two feet from the ground; also a pen with two windows. The flocks were of the same breed and very similar. Those which had less light did not look as well, nor did they lay as many eggs as those in the pen of two windows. After a time I made a change, putting in more windows, and extending them nearly to the ground. A marked improvement ensued.

The feed should consist of as great variety as possible. For the past year the morning ration of our fowls has been composed of scraps and waste from a large boarding-house,— meat, vegetables, bread, etc., thoroughly cooked in a large kettle set in an arch in one of the buildings. This is mixed with Quaker Oat Feed, two parts; shorts, two parts; middlings, one part, and fed warm. If I had not this regular supply of table waste to depend upon, I should substitute potatoes, apples, and any vegetable obtainable. At the same time fresh water is placed in their dishes. I feed but twice a day. In the middle of the afternoon I give a feed of corn, oats, and wheat, varied according to season and breed of fowls. I feed Leghorns more liberally on corn than the heavier breeds, as they do not trouble about taking on fat.

Oyster shells and grit are kept before them throughout the day. I also give them fine hay twice a week, and sweepings from the barn floor. Straw or dry leaves is thickly strewn upon the floor, and upon this the grain is thrown to induce exercise, and provide a substitute for a scratching shed. This constitutes daily rations for full-grown fowls.

Previous to this year, I have fed young chicks a mash composed of middlings, oat feed, shorts, and corn meal, with a sprinkling of animal meal. Now, I give them a mash, one-

half of which is the cooked food given the older fowls, the other half, middlings, oat feed, shorts, and corn meal. They eat this eagerly, and grow finely.

Poultry are proverbially early risers, and should be fed in the summer as soon as 5 A. M.

In order to succeed with poultry it is necessary to give the strictest attention to details. This is not unpleasant or difficult to one who enjoys the care of fowls, and no one else should attempt this business. Watch the drafts. Fowls will take cold, or suffer from nervous shocks to the system as a person. Where an egg record has been kept, it is evident a cold spell of weather causes a serious shock to the nervous system of the fowl, from which it requires some time to recover. Our inquiries and observations have satisfied us that every shock to the nervous system leaves, as it were, an indelible mark on an animal. Thus, we can easily see how changes of temperature, improper feeding, frequent frights caused by hasty and careless movements on the part of the attendant, would soon cause lasting injury to fowls. We urge every breeder of poultry to carefully guard against everything that could disturb the nervous equilibrium of his birds. Do not change them to another pen unless absolutely necessary. If you find one suffering from a cold, attend to it at once.

The best remedy I ever used is sulphur. Two lumps as large as a pea, repeated in twelve hours if necessary, will prove an almost certain cure. A few drops of kerosene on the head is also a good remedy.

Sometimes a fowl becomes crop-bound. This is determined by noting the distended crop, and the dark appearance of the comb, although the latter is also indicative of other diseases. The only way to save life in a serious case is to cut the crop with a sharp knife, remove the contents, and carefully sew up.

Too rich or sloppy food will cause trouble with the digestive organs. This is difficult to cure, but it is wise to isolate the fowl, and keep on a spare diet.

The condition of the pen should receive attention. In the summer I put in a sufficient quantity of fresh earth to raise the level of the ground in the pens about three inches above that outside the buildings. This is done in order that water may not run into the pens during the fall rains. A thick layer of straw or dry leaves is then strewn over the ground. I regard the earth much better than a wood floor. Windows are superior to ventilators, as they allow the escape of foul air and dampness near the ground, while ventilators let out warm air. Once in three days, fresh earth should be thrown on the droppings, and the roost-boards cleaned weekly. The poles and the nest-boxes should be saturated with kerosene oil, to kill the red mites. A handful of air-slacked lime put in each nest is a further preventive of this pest.

Finally, go through the pens at night-fall to see if everything is secure, that the ventilation is good, the air being neither warm and close, nor yet too cold with drafts, and also to note that every bird is in its normal health, as is evidenced by easy breathing and natural position.

A word as to disposal of surplus stock. Let all hens which have not proved good layers throughout the year be marketed. As a rule, the heavier breeds should be disposed of when a year old. Pullets are far better layers than old hens; however, it is advisable to keep a few of the best layers, which are also the best specimens of their breed. In this way, you will reproduce your most desirable stock, as eggs from old hens produce stronger chicks, and you will also preserve your best laying stock. The smaller breeds can be kept with profit three years. All poor layers, those under size, and those over fat should be marketed the first year.

Cockerels should early be removed to a separate pen and fed, first for development, then for fat. Their diet at first should be varied: when well grown should be restricted to corn and corn meal. At all times the feed should be very liberal. All the details of dressing poultry should be done in a neat and thorough manner.

Renewing the stock. Upon this depends success or failure. You may meet all other requirements, and yet fail because you have neglected to keep your stock in best condition. Some breeders advocate the disposal of all mixed stock at any price, and the purchase of thorough-breds. The average farmer cannot afford to do this. I believe in thorough-breds as firmly as any one, and have often wondered why farmers persist in keeping a flock of mongrels, when it does not cost any more to keep pure breeds. The impression is quite general, that thorough-bred fowls are all show and no utility. This is not so, as they give larger returns in dollars and cents, and then how much more pleasing is the appearance of a flock of nice-plumaged birds, uniform in color and size, than a flock of scrubby fowls of all sizes and colors. Therefore, I would say, keep pure poultry.

An economical and satisfactory method for the person of average means is to get a few really fine birds of the breed desired, and raise his own stock. It will take a little longer, but it is safer and less expensive, while the results are quite as satisfactory. Of the larger breeds, raise ninety per cent of the stock you wish to carry, keeping over ten per cent of birds one year old; of the smaller breeds, raise forty per cent and keep over thirty-five per cent of those one year old, and twenty-five per cent of those two years old.

In closing, I wish to say: Any one, who has a natural liking for the care of poultry, may surmount all obstacles in the path of success, by dint of patience and hard work; but let not that individual who looks only to the financial returns, deriving no pleasure from the well-being and development of his flock, undertake this business, as it will prove a daily task, with failure as the result. As in every business, successful achievement depends on love of the work for its own sake. Neither let that one attempt it who values his own ease or morning nap, for laziness is at a discount in the poultry yard. Begin with a few birds; work slowly, studying cause and effect; and as you gain experience increase your flock. Read, study, compare. Manage your poultry in a business-like way, and they will give you business-like returns.

SHEEP AS FARM ANIMALS.

CHARLES B. HOYT, SANDWICH.

No farm animal presents so great a variety of size, form, color, or covering as the sheep, and of the beast family none show such a diversity and in general appearance differ so widely, except possibly the dog. From the Arctic circle to the equator are found the sheep, roving over barren mountains, through deserts, and in fertile valleys, subsisting upon every variety of edible forage, nibbling the grasses, cereals, and clover, browsing leaves and bark from stunted forest shrubs, cropping aromatic and bitter herbs, and even devouring its own wool, which may be soft and spiral, long and coarse, fine and furry, or short and hairy. Sheep may present every shade of color from white to black; they may be dwarfed or massive, with horns widely differing in size and shape, or with none at all; the tail may be long or broad, or there may be none discernible to the eye. The best of clothing is made from its wool. Its flesh furnishes a favorite food for nearly every nation. In the East, to some extent, they are still used as a beast of burden; the milk is used as a beverage, and butter and cheese are made from it.

Notwithstanding like produces like in the animal as well as in the vegetable kingdom, there is no animal in which a change can be made as quickly and satisfactorily as in the sheep. As the horse is bred for speed and endurance, so we can breed for wool or lambs or any of the above mentioned qualities, the result depending on the skill and persistence with which we labor. The calling of the shepherd has been from time immemorial. Abel was a keeper of sheep. Job possessed 14,000. In modern times the most enlightened nations have regarded sheep as essential to their manufacturing interests, and agriculturists as one of the staple products of the farm. The origin of this widely diversified animal is unknown, although naturalists claim that there were but four distinct varieties: First, the Mouflon, inhabiting Corsica, Sar-

dinia, and the islands of the Mediterranean; second, the Argali, which range over the steppes or inland plains of Central Asia, and are larger and hardier than the Moufion; third, the Rocky Mountain, called by the western hunter the Big Horn, found upon the plains west of the Mississippi and in the mountain region to the Pacific, and are still larger than the Argali; fourth, the Bearded sheep of Africa, which inhabit the mountains of Egypt, and are covered with a reddish hair. The Rocky Mountain breed are doubtless the foundation of all North American sheep; but the importation of them from South America and the Eastern hemisphere has resulted in an infinite number of crosses until few flocks in the United States can lay a just claim to unmixed purity of blood.

When the American colonists came to this country they brought with them the spinning-wheel and loom, and one of the first lessons to be taught in housewifery was the art of spinning and weaving, and from then until the present day some of the country people have manufactured their coarser clothing, and were more of us doing so at the present day a better condition of things would prevail.

About the year 1800 the first Spanish Merino sheep were brought to this country, and for fineness of wool, for ability to adapt themselves to any variety of climate, and to still retain the same superior qualities of wool under the burning tropical sun that they do in the frozen region of the north; with an appetite that will cause them to thrive with common care upon coarse food; with a patient, gentle disposition that makes them peaceable in whatsoever pasture turned, the Merino still holds the first rank. In New Hampshire, the first Merino sheep was introduced about 1810. In 1861 almost all of the sheep of our state were of Merino grade; since then the Leicester, Southdown, Irish, and Cotswold have been brought in until, in 1890, twenty per cent of our sheep were of the native stock, twenty per cent of grade Merino, and sixty per cent of English blood. While the Merino produces the best quality of wool the Southdown, Leicester, and Cotswold are heavier, furnish more wool, are better mothers, and are fast gaining ground in New England.

Fifty years ago wool was the chief source of income in sheep husbandry, but with the increasing popularity of mutton as an article of food, it has become of secondary importance. The Southdowns, with their intermingling streaks of fat, are superior to the coarser breeds where the fat is mainly upon the outside. Fifty years ago the average amount of wool used by each individual was 4 pounds. Now 8.3 pounds are used, of which 5 pounds are produced in the United States; 1.6 pounds are imported in wool, and 1.7 pounds in manufactured goods, including carpets and all forms of clothing. The question as to the ability of the United States to raise all the varieties of wool needed can be settled when we remember that we have twenty-four degrees of latitude, with altitudes ranging from the semi-tropical to those of perpetual snow; with a soil so rich and varied that it presents all the possibilities of the old world except the strictly tropical and absolutely polar areas. We can, therefore, produce without limitation the Merino, the mutton breeds of Great Britain, and the coarser types from Mexico, or from Asia, Africa, or the isles of the sea.

We are often told here in New Hampshire at the present day, that it is well enough for us to keep a few sheep to keep down the weeds in our fence corners, but that the sheep industry belongs to the great grazing states of the West. But when properly managed, taking into account our nearness to market, our hillside pastures with their pure springs of water, we still have in our mutton and wool producing sheep one of the best paying branches of farm husbandry. From what farm animal do we get so quick or so many returns,—the dressing for April, the wool for June, the lambs for August, and the mutton for winter? Each sheep annually producing about fifty cents worth of manure, a lamb worth $3, and wool worth $1 or more, at a cost of about $1.50 for food furnished during the winter months, we not only get a quick return, but we have something to show for our labor at the end of the year. The raising of "hothouse lambs" is carried on quite extensively in localities near some

of our large cities. To be successful one must be able to change the conditions of December and January to those of April and May. The lambs should be born in November; the sheep shorn so as to require the same temperature as the lambs; their quarters should be light, well ventilated, and warm enough so that water will not freeze. Food must be nutritious; roots and oil meal are good and essential. The lambs should be largely fed through the mother, and ready for marketing in from two to three months. The leading hotels, club-houses and private customers are paying from twenty-five to forty cents per pound from Christmas to Easter for fat lambs, weighing fifty pounds or more. But for the average country farmer, we believe that early lambs raised in the ordinary way, and ready for market by the first of August, are the more profitable, as the cost of pasturage and care is trifling. We believe, as well, that the ordinary farmer will get better returns from a good flock of well graded sheep than he can from thoroughbreds, as but one man out of a thousand is adapted for the successful handling of the latter.

It is estimated that 13,000,000 sheep and lambs were consumed in this country last year. In many localities dogs are a menace to the sheep industry. The most of the disorders incident to sheep are due largely to the want of proper care and activity. Sheep should be kept warm, clean, and dry during the winter, in order that their wool and feet may be in good condition. They often suffer during the long winter for the want of green food unless supplied by giving roots. In the summer wood ashes mixed with a good supply of coarse salt, with their noses occasionally smeared with tar, will keep them healthy, and prevent the maggot fly from depositing its egg and producing the grub which is more destructive than any one disorder affecting our sheep in this locality.

In closing, let me state to you some of the advantages to be derived from sheep as a farm animal:

They weaken the soil least, and strengthen it most.

They are enemies of weeds.

The care they need is required when other farm operations are slack.

The amount invested is not large.

They are the quickest and easiest handled of all farm stock.

Mutton is freest from disease, the most nutritious and healthful of all animal food.

There is no other product of the farm that has fluctuated so slightly in value as good mutton.

By comparison, wool costs nothing, for do not the horse and ox in shedding their coat waste what the sheep saves?

From cash grains fed the other farm products are largely made, while those from the sheep are made principally from the pasture.

Careful experiments have established the fact that a pound of mutton can be produced at less cost than flesh of any kind.

THE CONSERVATION OF FERTILITY.

WILLARD BILL, JR., WESTMORELAND.

From a farmer's outlook it seems clear that there never existed a time when there was a greater demand made upon the agriculturist to practice intelligent economy, correct business methods, with a broad understanding both of the laws and forces that govern and control animal life, the necessities of vegetable life, with a clear comprehension of the status of demand and supply that control the market in all of its varying phases, than at the present time. Slipshod farming never paid, nor never will. We have left the iron age for that of steel. We have arrived at that period when brain farming must precede and direct the muscular, if satisfactory results be obtained. The virgin fertility of our soils has long since been in a large measure exhausted. The time has passed when its cropping without its feeding will give us a paying income, and so we are forced to feed our soils more liberally, and at the same time to study the lesson and practice the solution of pursuing an intelligent economy of fertilization. This must and will be secured by preventing an undue waste of plant food in the soil, and by so liberating it, in the soil, that it is free and available for the building up of plant and animal tissue.

Business methods in agriculture I conceive to be similar to those of other pursuits. It consists of a careful accounting of receipts and expenditures, both as relates to particular crops and to particular fields; also, of introducing into our computations not cash returns alone but a careful appraisal of the actual capital within the soil, both at the time of the planting of the seed and after the harvesting of the crop. We cannot judge as to this or that crop being the most profitable to grow unless we take into consideration the amount of plant food left in the soil by the roots of the respective plants. However widely we may differ upon many points relating to farm husbandry, we surely must agree upon this,

that any system that reduces or impoverishes the soil is suicidal. Both common sense and reason protest against checking out of our soil banks more than we deposit, and wisdom proclaims that we yearly add to the balances in our favor, and I mean by balances simply conservation of fertility.

In speaking of the laws and forces that govern animal and plant life, we are led to wonder and admire the infinitude of species and varieties of plants, each with its own peculiar organism, carrying with them their own peculiar laws, which must be complied with at the right time and manner to insure both increased fertility and success. Thus different crops require different treatment, both in fertilization and culture, and it is a grave mistake to follow along the old ruts that treat all alike. The great problem before us farmers today is, how can we secure plant food in the most satisfactory manner. I am inclined to the belief that we have relied too exclusively upon barnyard manures, by ignoring all other sources that we can and should draw upon. I do not wish to be understood as underestimating in the least the superlative importance of barnyard manures in maintaining the fertility of our land. I regret that they are not adequate to satisfy the demand. In former times farmers found the case otherwise. However careless they might have been, though they suffered the manures to be unsheltered from the drying sun and the washing of rain, still they succeeded in raising fair crops, but at the cost of loss of fertility every time, and, while they accumulated goodly bank accounts, they transmitted to their posterity impoverished farms. What then are the factors to call into requisition to assist our barnyard manures in the maintenance and improvement of the fertility of our soils?

I will mention first that culture is of prime importance, and yet, as a rule, not fully nor properly applied nor generally correctly understood. We know that land produces abundantly when left to itself, and steadily grows more fertile, and the question naturally arises, why should we plow at all. The answer is apparent when we consider the fact that na-

ture, as a rule, produces few fruits or tubers that are sufficient to satisfy the wants of an educated appetite. Nature is so profuse in quantity that quality is sacrificed. Plowing is an expeditious way of destroying plants, and thus is wrought its primary purpose. College diplomas are as common as the leaves of Vallombrosa, but diplomas earned and won at the end of the plow handles are rare indeed. Simply inverting the sod does not alone constitute good plowing, although the furrow may completely bury the surface vegetation, and be as smooth as the floors of palace halls. The chief object of plowing is to pulverize the soil, and if this be imperfectly performed, then the error can never be fully remedied by the best harrow or cultivator ever invented. Thus the plow not only leads the van of farm culture, but easily assumes the rank of the peer of all farm implements. Every plow should have a jointer or skim plow, and set deep enough to break up the tenacity of the sod; with a bold moldboard, that leaves the furrows corrugated or slightly lapped, thus enabling the harrow and cultivator to break the crest without disturbing the sod. As fining the soil is the object of plowing, then it follows that while perfectly flat furrows may look pleasing to uneducated eyes, they really are antagonistic to the ready and proper fining of the soil. As air and moisture are indispensable factors in building up the plant, a corrugated furrow offers the greatest facilities for the operation of both. Professor Roberts, a very good authority, states in one of his lectures that often in 100 pounds of soil of good land may be found one fourth pound potash, one eighth pound of phosphoric acid, and one half a pound of nitrogen. It follows then that one foot of the surface upon an acre of land weighing 1,600 tons would contain 8,000 pounds of potash, 1,000 pounds of phosphoric acid, and 16,000 pounds of nitrogen. While we must not consider that the full amount of these elements of plant food can be made available, even by the most thorough fining of the soil, still a sufficiency could be obtained to very materially assist the deficiency of barnyard manures in keeping up the fertility

of our soils; and when we consider that a corn crop of fifty bushels to the acre removes from the soil but 96.2 pounds of nitrogen, 32.6 pounds of phosphoric acid, and 68 pounds of potash, we can readily perceive that the soil possesses ample supplies of these elements for many years to come, if they were only made available. Thorough culture will in a measure unlock to the plant its stores of wealth.

In our old Granite State we have thousands of acres whose meagre returns indicate poverty, that are outrageously slandered. They need thorough tillage, which always must precede or be co-existent with fertilization. I am not advocating by any means the cultivation of all our rocky fields, for I believe that we have considerable areas that were intended by nature for forestry, and as I look over the many ragged mountain sides, destitute of vegetation, I am made aware that man has murdered his best friend, and I feel like the poet who exclaimed "Oh, woodman, spare that tree!"

The conservation of fertility of our soils can be largely augmented through the instrumentality rendered by the aid of plants. It is one of the generally recognized facts of vegetable physiology that plants not only use elements of the soil already available, but they have power to a considerable extent of setting free their own food. A thorough fining of the soil enables plants to extend their rootlets to a considerable distance; in some cases, many feet. Some plants have a strong tap root that penetrates deeply the sub-soil, if it be porous, and from it brings to the surface large amounts of plant food and makes it available to the shallow growing cereals. The roots of a single clover crop, for instance, left in the land, may leave a hundred pounds of nitrogen in an acre of land, all of which may be made available for plant food. With the decadence of clover as a successful forage crop, undoubtedly peas must take its place as a leading successful nitrogen producer. Other crops are known to be prolific nitrogen producers, and I feel safe in making this assertion, that a course of rotation of crops could be adapted that would relieve us from the necessity of purchasing, to any great extent, commercial nitrogen.

The operations of nature are truly wonderful, and surprisingly successful, and the nearer the husbandman conforms his management to harmonize with its laws, the greater will be his success. The time is coming, and I think it is near at hand, when farmers will understand more clearly than they do now, that a correct business method demands that they should wisely direct the forces of nature so that maximum crops can be produced at the least possible cost. Our national congress has been and is engaged in working out a solution to avoid a constant increasing of our national indebtedness. Their efforts have been entirely in the direction of increasing income. It has not occurred to these wise men yet that the accounts can be and should be balanced by curtailing reckless expenditures. Farmers must exercise common sense, even if their legislators do not. They must adopt a business method that will at the same time enlarge their incomes and reduce their expenditures.

Observe the wondrous working of the plant in its efforts to conserve the fertility of the soil. Their roots have power to exude their sap upon the surface; this unites with the earthy particles in contact, and thus plant food is made available. The water that conveys plant food in the earth may be richer than the sap of the plant; then molecular attraction results and a transfer is effected. This process is similar to the diffusion process used in extracting sugar from the beet. Some plants have roots curiously covered with living organisms that directly feed upon the nitrogen in the air, and thus are active factors to conserve the fertility of the soil. Thus I have hastily and imperfectly sketched the aid to be derived through plants in the conservation of fertility in the soil.

I now approach the use of commercial fertilizers as an additional aid in supplementing the deficiency of barnyard manures in the maintenance of successful farm productions. I look upon all honest commercial fertilizers with favor if properly used, but at present market prices they are far too costly to yield a fair margin for labor, use of land, and taxes.

It is stated upon good authority that American farmers have paid out, during the last thirty-six years, more than eight hundred millions of dollars for commercial fertilizers. This sum represents the entire market value of any three years' crop of wheat. I have doubts that this vast expenditure has been justified by the demands of any correct business method. When properly applied and duly composted with brains, I have no doubt that the purchase of commercial fertilizers have been judicious investments. But I say this without fear of contradiction, that farmers have made a grave mistake in relying too greatly upon the chemist and his warehouse to the exclusion of his own brain. To further illustrate my meaning, I would say, that any farmer who depends upon commercial fertilizers to take the place of inadequately fining his soil will not be successful. Shiftlessness must be supplanted with hot plowshares. Large expenditures for commercial fertilizers will not do it. I look upon complete fertilizers for every field and universal cure-alls for every patient as twin companions. When I consider that soils vary so widely, even upon the same field, and that their wants must be as widely different, then I can only come to this conclusion, that the farmer should have his trial plots and ascertain thereon just what is needed, and only purchase the particular element that is needed. To purchase and apply to the land any element with which the soil is fully supplied, is simply throwing money away. The practice of allowing barnyard manures to go to waste under bleaching suns and drenching rains, and of purchasing largely commercial fertilizers, reminds me of a story of an Irishman who, when passing through a wood, found a man sinking in the quicksand. He ran over to where there was a Yankee chopping near by, and he says, "For the love of God, come here; come here, as quick as you can; here is a man sunk in the morass." "How is he sunk?" says the Yankee. "Sunk in the morass, sir; so he is, sir." "How far is he in?" "Well, sir, he is up to his ankles." "Oh, well, he will get out." "No, sir, for I forgot to tell you that he has gone in the other end first."

We have too many farmers who sink their heads, and then undertake to do business with their heels. This sinking of the head, thought, and intelligence will never do. We have reached a time when it takes a bright brain and a keen intellect to make a successful farmer.

I now reach the last division of this branch of my topic, and offer a few thoughts upon the agency of barnyard manures as a factor in the conservation of fertility of our soils. Barn manures, by virtue of their supreme importance in the maintenance of soil fertility, should be considered emphatically the farmer's capital, and yet we see too many instances where it is looked upon with as much indifference as some savings-bank trustees have upon their assets, and the consequence has been that these banks have suspended and passed into liquidation, while in the other cases, lands have impoverished and passed into abandonment. These farmers remind me of a certain Irishman who was trundling along a barrel upon a wheelbarrow, and upon meeting an acquaintance was asked, "Well, Mike, what have you got there?" "And, be gorry, I don't know," answered Mike; "one end of the barrel is marked Irish whiskey, and the other Pat Dowdy." Farmers should know whether they are carting to their fields whiskey or Dowdy.

It has been found upon careful weighing and experimenting that a cow weighing 1,000 pounds, stabled and liberally fed during the six winter months, will make, including the bedding, 5½ tons of manure; that analyzed would give to each ton 15.6 pounds nitrogen, 8 pounds phosphoric acid, and 17.8 pounds of potash, which elements, computed at market rates, would give a value of $3.61 per ton. But it is a well known fact that these elements when found in barnyard manures are not of equal value of given weight, as they are in the high grade commercial fertilizers. So we will reduce this value one half and call it $1.80 per ton, and this would give the value, based upon chemical valuations, of a well fed, stabled cow, of $10 for the six winter months, and of a horse it is computed at two thirds as much. This com-

putation is made upon the basis that no waste is at any time suffered.

Now in order to illustrate the penalty imposed upon the farmer by his own act of negligence in not properly caring for his barnyard manures, I desire to cite an experiment conducted at the Cornell experiment station in 1891. The gross weight of a quantity of horse manure exposed to the weather from April to September lost in weight fifty-seven per cent, in nitrogen, sixty per cent, phosphoric acid, forty-seven per cent, in potash, seventy-six per cent. The value per ton at the beginning of the exposure was $2.80; at the end, $1.06, showing a loss of sixty-two per cent of the most valuable part of the manure. It is needless to pursue this point further. Wherever manures are thrown out under the eaves of the barn or thinly scattered over the yards, or wherever subjected to intense heat or leaching, the probabilities are that from one half to three fourths of the real value is lost. Neither farming nor any other business can hope to thrive, pursued under such ruinous methods, and many are the farms that bear ample attestation to the fact. A basement beneath the barn for storing and protecting manures is a veritable mint for any farm or farmer. Where the cellar is not feasible, then suitable lean-tos can be substituted. With either, both quantity as well as quality of manure would be largely augmented.

I now come to the point of when and how should manure be applied to the land, and the answer must be controlled in part by the kind of crop desired to be grown, the nature and the quality of the soil, and the lay of the land. My own observation, extending over many years, has demonstrated to me that spreading manure upon the sod in the autumn produces a decided increase of corn the ensuing year. Upon my fields, I am satisfied that, as a rule, it would be no exaggeration to put the increase at ten bushels per acre over spring applications. Upon very steep hillsides, autumn spreading of manures might not be advisable on account of the liability of washing away, though I believe that there will always be

found a greater loss from leaching of manures than from evaporation, especially so upon all gravelly or sandy soils. Having applied the manure in late autumn for my corn crop, and spread it evenly, I make it a practice to go over the ground, as soon as the ground has settled in the spring, with a straight-toothed harrow to pulverize any lumps and to supply any vacant spots. I am not persuaded that it is wise to haul manures in winter, and deposit in small heaps over the land, although some farmers advocate the practice. I would house the manures carefully during the winter months. If the grass crop was my aim, I would plow and thoroughly pulverize my land the latter part of August or the first of September, working into the soil with the harrow a liberal dressing of manure, sowing a variety, and liberally, of grass seed, covering lightly and finishing with the roller.

Thus I have hastily and very imperfectly outlined the principal agencies that should be employed to increase the fertility of our soils. We cannot afford to grow half crops; we must aim to secure premium crops every time, for these alone return a profit; but they must be grown at the least cost, leaving the soil in a better condition. I am aware that many have wondered what farmers can do with the sterile soils of New Hampshire, and many of our young men have left in despair for distant climes, and not always with gratifying success. The experiences of the last few years have been a trying ordeal for the farming industry everywhere; but they have served a good purpose. They have clarified our vision, to enable us to see with a clearer light, and to understand more fully that even here in the dear old Granite State science, economy, and industry will win a success for farmers. He who best solves the problem of increasing the fertility of the soil, and the most effectively accomplishes the same, is truly a benefactor.

Thus I have outlined in a measure some points suggested to my mind by the theme given to me by our worthy secretary. While the theme of business methods as applied to farming is one mountain high and ocean wide in its scope, I

have only attempted to touch upon some points deemed by me as most essential, and with a few terse pointers I will leave my suggestions for you to consider.

Everywhere all over our state I have seen, as a rule, that farmers make a grave mistake in skimming over large areas for lessening crops, and constantly lessening their assets of plant food in their soils. "Be great, but pay the price of greatness," exclaimed the Athenian orator, and a correct business method as eloquently proclaims to us farmers, "Till well what you till, grow paying crops, but those that adequately feed your land first."

Farmers do not heed the dictates of a good business method in rushing into every new fad that comes along. Many have been the Klondike rushes to seize a golden prize. The first opened placers may have been successful, but woe has been the portion for all late comers.

The milk business for a time paid, and cows rapidly drove out our sheep and beef cattle. With firmer spines, and more sand, that shall produce a co-operation in fact as well as in name, the milk business may see a brighter day; we cannot expect it before.

A correct business method would place into closer relations the producer and the consumer. While the middleman may in a measure be useful, when he assumes the part of a dictator, to Jew the consumer and rob the producer, it is wrong, and should not be endured.

I cannot believe that the New Hampshire farmer will always be content to rely so completely upon his Western brother for his supply of food and raiment. We should grow and produce both, and we could if we only would. Self reliance invites independence, and independence is said to be the crowning glory of American citizenship. We have in New Hampshire large areas adapted for growing corn; why not grow corn then? Statistics show that the average yield per acre of corn in our state is only surpassed by one or two states of our entire Union. Devote each and every field to that crop which is best adapted to its growth. If that growth

is that of forestry, then prohibit the birch, cherry, and scrub oak, and like, and encourage the chestnut and the white pine, for their rapid growing qualities and value for timber.

A correct business method declares a shilling earned and saved to be worth more than a pound foolishly spent.

And finally, friends, allow me to say that a sound business method would seek to place New Hampshire agriculture, so far as possible, upon the enduring foundations of self sustenance.

Friends, we cannot expect that farming in New Hampshire will ever assume the proudest, fullest measure of success that it is capable of maintaining until we devote greater industry and a greater consideration to the ingathering for, and a more liberal expenditure of, brain fertilization to our soils.

THE RURAL SCHOOL PROBLEM.

CHANNING FOLSOM, DOVER.

An encouraging feature in the educational outlook of New Hampshire is an invitation to a school man to address an assemblage of farmers on "The Rural School Problem," for though my tastes and recreations run largely to rural life, my knowledge and observation on this subject are entirely from an educational point of view.

Is there a rural school problem; and if there is such, what has brought it into existence? If no such problem confronts us, this discussion is idle; if the secretary of the State Board of Agriculture has invited me to speak upon a trouble that has no existence except in his active brain; if I am requested to fight windmills, or men of straw, then is this part of your exercises utterly useless. But unless all signs fail, unless the testimony of all thoughtful observers in the state and elsewhere is at fault, there *is* a very serious rural school problem, that demands for its solution all the unselfishness and all the patriotic consideration of every loyal son of the old Granite State.

The following sweeping arraignment was not written specially for New Hampshire, but for rural New England generally; if, however, on examination we find that the coat fits us, let us put it on, and face the situation man fashion.

Jno. Gilmer Speed, in the October (1895) *Forum*, says: "The average pupil of the average country school does not even learn to write with ease or plainness. . . . The inefficiency of the country school has resulted in what might quite properly be termed 'The American peasantry' being as illiterate and unlearned as any class of people in any civilized state in the world. An assertion like this is likely to be called un-American by those shallow critics who maintain that Americans should never speak the truth of themselves and their institutions which have become debased. The American farmer of two generations ago was a better edu-

cated man than is the American farmer of to-day. No one would ever have thought of calling him a peasant; he did not suggest such a thing in his manner of life, poor though it was; nor yet in his manner of thinking, though that may have been narrow.

"Let any candid observer go into a neighborhood where the land has been tilled by the same family for generations, and let him find a farm where there are still three generations upon it. He is almost sure to find that those of the oldest generation can speak, write, and think with more accuracy than the second generation, and that the second generation show more evidence of education than the third. This shows degeneration, and this degeneration can be directly traced to the decadence of the country public schools, which are now really beneath discussion, were there not a hope that by telling of their badness some interest might be excited, and that through this interest they might be improved.

"We do not want a peasantry in this country,—we have no use for peasants. But we are getting such a class, both by importation and breeding.

"There is no use in refusing to look facts squarely in the face, and the fact that country people—agricultural people—are growing more ignorant generation by generation is so patent that instances or groups of instances need not be recited to prove it. The mere spending of more money on country schools will not effect any reform. The states, for a while at least, must take the schools in the rural districts under control."

We are fond of referring to the "good old times when we were boys" to prove that the rural schools are good enough. Nothing that I may say can be construed as a lack of appreciation of the grand work done by the "little red schoolhouse" of New Hampshire for the state and for national progress. In its day it was a power and it was a power because the men of New Hampshire understood it and appreciated it.

In the "good old times," New Hampshire was an agricultural state; the population was more equally distributed; farms and farming population were increasing; land was being cleared up; new farms constituted; young men making farm homes, marrying and rearing large families of children. The school was large; distance no obstacle to attendance; the whole community was interested in education.

To-day, New Hampshire is largely a manufacturing state; transcontinental railroads have brought the great West to our very doors; this competition has changed the character of our agricultural industry; the villages and cities have drained the rural towns of their young men; a native Yankee family of ten children is as rare as a farmer's barn with three yoke of oxen. The school that formerly had fifty pupils, ranging from four to twenty-four years of age, now has from five to ten, all under fourteen years of age.

Then, teachers, men or women, were employed, with strong, virile minds, not always highly educated, but almost invariably of maturity and endowed with good common sense. *Now*, the same schoolhouse contains as teacher a young girl of little experience, no training, and frequently, with poor scholastic education; and the great mass of the people seem perfectly indifferent to the situation.

Until we recognize the fact that changed conditions demand changed treatment, as much in educational matters as in those purely agricultural, we must not look for improvement in rural education.

It is somewhat the fashion with people of short sight and poor memory, to attempt to fasten the decadence of our country schools upon the town system adopted in 1886; these people talk as if the district system was the original one under which education in New Hampshire was inaugurated; they forget, if they ever knew, that till 1805 the town was the educational unit, and that care of the schools devolved upon the selectmen of the town; and that not till 1827 were prudential committees from each district authorized by law.

So far from contributing to the decadence of the country

school, the return to the town system was mainly brought about by this very deterioration. Under the district system gross inequalities of school privileges existed in adjoining districts of the same town,—ten or twelve weeks, perhaps, in one district; twenty-five to thirty in the next.

Said the school committee of Madison in 1853: "The unequal distribution of the school money is a question to which the attention of the town is respectfully called. By a bad arrangement of school districts, and a wrong principle of distribution, it is true in fact, that scholars in some districts receive three times the amount of schooling which is enjoyed by scholars of the same age and attainment in other districts. Is there any good reason why a portion of the scholars of this town should be shut out of the school-room by the arbitrary limitations of district boundaries?"

The same inequality that formerly existed between adjacent districts of the same town, now exists between different towns of the state. So that we have two chief causes to which we may attribute the present low condition of the rural school, viz.: 1. Poor teaching. 2. Short schools. As a rule, the smaller the school, the poorer the teacher that will be accepted for it.

"Our school is so backward that anybody can teach it," is a rule accepted and acted upon in many towns, and as incompetence demands less pay than competence, the cheapest is considered good enough. People without children in the schools aim to cut the school expenditures to the lowest possible sum. Such citizens have no conception of the object of the school. By what right does the state tax the childless bachelor or corporation property for public education? Why should your property be burdened to educate my children? The state does not require education for the child's sake primarily, but for the reflex action of that education upon the state itself. Public education is a protective measure for the perpetuity of republican institutions. The only safety of the state and the nation lies in an intelligent citizenship. On this ground, and on this only, can general taxation for the

support of schools be justified. The property owner without children is equally interested, from this standpoint, with the head of a family.

It has been well said that "the corner-stone of our system of public schools is the fact that, though an ignorant people may be governed, only an intelligent people can govern themselves."

Nor is the school a local institution merely, to be governed by the whim or judgment, the parsimony or liberality of the town in which it is situated. Its goodness or its badness affects the whole state. The state, then, has a right and a duty to perform relative to each school. The educational facilities of the smallest, humblest, poorest, most remote town are of vital interest to us, just as it is a proper subject of inquiry with us as to the manner in which the cities are enforcing state laws relative to school attendance.

The United States commissioner of education informs us that New Hampshire ranked third in diffusion of education, in 1870, in respect to the "native white population," among the states and territories of the country; eight tenths of one per cent of our population at that time being illiterate. In 1880, we had fallen to the fourth place, with one and one tenth per cent; and in 1890, to the ninth, with one and five tenths per cent. Thus we see that in twenty years the percentage of illiteracy among our "native white population" nearly doubled.

How shall we get better teachers? When Horace Greeley was asked how to resume specie payments, he replied, "The way to resume is to resume." When any community undertakes to raise the standard of its teaching force, it will find but little difficulty. The reason for the employment of incompetent teachers is the willingness of the people to receive them.

The state furnishes an excellent training school for the professional preparation of teachers, viz., the State Normal School. Criticism is frequently made that the school attracts so few pupils. This criticism is superficial and unfair; there is always a supply of such goods as the market demands. Let

the market demand trained teachers, and would-be teachers will get the training. If you are to employ a carpenter, a blacksmith, a builder of stone walls, you seek a man trained or practiced in these respective arts or occupations; if your colt is to be trained for the race-course, you look for a man familiar with the training of colts. But if your children are to be educated, you inquire how *cheap* a teacher can we find.

In the first report of the Massachusetts board of education, issued Feb. 1, 1838, appear the following statements relative to the preparation of teachers for their work:

"Nor can it be deemed unsafe to insist that, while occupations requiring a very humble degree of intellectual effort and attainment demand a long continued training, it cannot be that the arduous and manifold duties of the instructor of youth should be as well performed without as with a specific training for them. In fact, it must be admitted, as the voice of reason and experience, that institutions for the formation of teachers must be established among us before the all important work of forming the minds of our children can be performed in the best possible manner and with the greatest attainable success. . . . Whatever tends to degrade the profession of the teacher in his own mind or that of the public of course impairs his usefulness; and this result must follow from regarding instruction as a business which in itself requires no previous training."

To this opinion of such men as Edward Everett, James G. Carter, Edmund Dwight, and Jared Sparks is added the testimony of the first secretary—Horace Mann. "Teaching," he says, "is the most difficult of all arts, and the most profound of all sciences," and then, after enumerating its difficulties and requirements, he asks: "Is it not worthy of the most solemn deliberation whether, under our present system, or rather our present want of system, in regard to the qualifications and appointment of teachers, we are in any way of realizing to a reasonable and practicable extent a fulfillment of the elevated purposes contemplated by the law? And will not an impartial posterity inquire what measures had been

adopted by the lawgiver to insure the execution of the duties he had himself so earnestly and solemnly enjoined?"

The state of New Hampshire has provided for the issue of permanent teachers' certificates to candidates passing satisfactory examinations. Graduates of the State Normal School receive these certificates in course. Every town that decides to give the preference, other things being equal, to teachers holding permanent state certificates, and is willing to pay a slightly increased salary to such teachers, is thereby exercising an influence towards the professionalizing of teaching, which will not only raise the teaching standard within its own borders, but will also be felt in a salutary manner beyond its limits. With the professional spirit, with increased respect for the occupation among the teachers, will inevitably come better work.

Superintendent Balliet, of Springfield, sums up the matter of trained teachers in these few lines: "Experience of years has shown very clearly that good schools cannot be created by resolutions of school committees or edicts of superintendents. The character of the school and the merit of its work depend upon the character and ability of the teacher. The school will never be better than the teacher who is placed in charge of it. If they are all trained and fitted for their work, the schools will be good; if the schools are in charge of apprentices, no amount of lecturing by the superintendent, and no minuteness of detail in the requirements of the course of study, can supply the deficiency. All the supervision that can be provided or devised will not make a good school where the teacher is incompetent, for the incompetency is always present in the school-room, while at best the supervisory influence can be felt only periodically."

Another source of better teaching will be better supervision.

Says State Superintendent Gowing,—"A weak feature in the school system is the lack of skilled supervision. The following permissive act was passed in 1895: 'Two or more towns or special districts may, by vote of each, form a dis-

trict for the purpose of employing a superintendent of the public schools therein, who shall perform in each town the duties prescribed by law and the regulations of the school board.

" 'Such superintendent shall be appointed by a joint committee composed of the school board of each of the towns in said district, who shall determine the relative amount of service to be performed by him in each town, and shall fix his salary and apportion the amount thereof to be paid by the several towns, and certify such amount to the treasurer of each town. Said joint committee shall, for said purposes, be held to be the agents of each town composing such district.' "

In Massachusetts, ninety-four per cent of all the school children of the state are under the charge of superintendents of cities, towns, or districts formed by union of towns.

In New Hampshire, nothing has been done towards the formation of districts under the above law. I can conceive no action possible that would more surely raise the country schools from the slough of inefficiency than the union of several adjoining towns under an active, competent, professional superintendent. I shall speak of the expense item under another head.

It can hardly be expected that the farmer, the doctor, the lawyer, the blacksmith, the editor, the carpenter, each busy in his own occupation, should be competent to solve all educational problems off-hand, or to instruct and inspire teachers in their special work.

Of course, in every community the curbstone philosophers and the flour-barrel jury of the corner grocery are ready to point out the correct way of carrying on every public enterprise,—erecting a building, constructing a bridge, or teaching a school,—but it is generally conceded that if a man is competent to do anything well, it is usually his own special work. Schools should be superintended by trained school officials. For this purpose two, three, four, five, or six towns should unite.

Better pay for trained teachers and the employment of trained supervisors may be hastened by the abolition of small schools in contiguous sections. This has already been done in many towns: in 1886, there were 359 schools in the state, each containing six pupils or less; in 1896, there were 131 such schools.

In illustration of the changed conditions of some of our rural towns, that have come to pass in forty or fifty years, the following examples are cited: Madison,—in 1853, the number of school children enrolled in all the schools was 228; in 1896, 117. Tuftonborough,—in 1848, the number of children reported as attending the *winter* schools was 357; in 1896, the entire number enrolled during the year was 128. Freedom,—in 1847, the enrollment was 249, with an average attendance of 201; in 1896, the enrollment was 109, with an average attendance of 82; the population in 1840 was 926; in 1890, 630, a loss of about one third.

Said one of the school commissioners of New Hampshire for 1855: "The evils of dividing and sub-dividing school districts cannot be fully realized without a knowledge of the consequences that have resulted from such an injudicious course. Such schools are usually instructed by incompetent teachers and are of short duration. . . . A scholar will make greater proficiency in a school of fifty scholars than in a school of ten, under the instruction of the same teacher. . . . There has never been but one objection raised against the extension of the boundaries of a district entitled to the least weight, and that is the increased distance of travel; and when the advantages resulting from a union are properly understood, the objection sinks into comparative insignificance." This is what a level-headed man thought over forty years ago under the old district system.

Perhaps no application of the "town system" has caused more bad blood than the consolidation of schools. Without doubt this has sometimes been done with poor judgment, and in an arbitrary manner, but we must bear in mind that school boards are chosen by the voters: if they choose poor

men, or if a large minority of the voters stay at home, and allow the election to go by default, the people and not the law are to blame. When the people of New Hampshire attend their school meetings as numerously as the town meetings: when candidates for the school board receive as large a percentage of votes as selectmen and road agents, the condition will be more hopeful.

The best teachers cannot be obtained for the three-scholar or the six-scholar schools. If these schools are to be maintained, it is inevitable that the majority of them will be in incompetent hands; of course there are exceptions. I speak not from theory alone, but from observation and inquiry as well. When any community deliberately insists on the maintenance of a school of from two to six pupils, so located that it may conveniently be united with some other school, I charge that community with deliberately sacrificing the interests of its children to its prejudices.

Again, whether the supervision is in charge of the school board or of a professional superintendent, better supervisory care will be exercised over the united schools than when separate. Better appliances, maps, charts, books, etc., can be afforded and will be furnished.

OBJECTIONS.

I will consider briefly some of the objections usually urged against the union of schools:

1. We are told that it will depreciate the value of farm property in the section where a school is discontinued. This objection deserves no consideration; but it must be mentioned for the reason that it is frequently advanced in apparent good faith. It is so utterly idle and childish; so utterly foreign to any connection with the object of public education; based so entirely on selfish and personal interests, as to be outside and beyond all argument. Imagine for a moment the founders of the public school system of New Hampshire suggesting that their neighbors be taxed to support a public school, to enchance the value of their farms. Properly and fairly

to carry out this absurd theory of public schools, the schoolhouse should be mounted on wheels and allowed to take up a resting place on each farm in turn. If the depreciation theory were founded on fact, it could not be dignified into an argument; but the facts are all the other way. Wherever country schools have been united to village or city schools, the union has almost invariably resulted in re-peopling the country section; giving families the advantage of the better village schools, with rural life.

2. Transportation of children to distant schools is objected to on the ground that they are away from home for the greater part of the day, and that left to themselves during the noon intermission they may be into mischief, in bad company, or in objectionable places.

3. It is objected that small or young children should not be sent at such distance from home that they can not in an emergency be allowed to return home.

These objections have a good deal of force, particularly when the consolidated school is in a village with its usual long noon intermission. Young children thus sent from home for the day should be under the care of some responsible person for the whole time. During the noon intermission some discreet woman should be employed to have charge of the children during the absence of their teacher. This can be effected at a small expense, and is desirable not only on account of the children, but also for the care and protection of school property.

4. It is urged against uniting schools and conveyance of children to a distant building, that it is too hard for children of tender age.

This also may be a valid argument against public transportation in many cases. It surely would be too severe for children five or six years of age to be carried five or six miles each way; but it is easier and entails less exposure for a child to ride three miles to the village school in a suitable vehicle, in severe or stormy weather, than to walk one mile to the rural school.

I know from actual experience that the regularity, punctuality, and amount of attendance are very largely increased by the public conveyance of children to school. The city of Dover has closed six of its ten rural schools, and furnished transportation to the graded schools. In no instance has this plan been adopted until the parents of the children to be affected have agreed to it; it is my belief that none of those parents desire to have their local school re-opened. The adoption of this plan has resulted in a reduction of expenses, greater harmony in the support of schools, and a very marked increase of regularity. The city expends about $1,600 annually for transportation of pupils.

The success of every plan depends upon its execution; eliminate good judgment and common sense, and add a quarrelsome, "kicking" community, and the best theory will fail in practice.

Whatever opposition appears to the union of schools, it must be remembered that we are confronted by a condition, not a theory, and that some remedy must be found. The school has dwindled from forty or fifty to three to eight; the expense has not materially diminished. On the other hand are certain admitted advantages: 1. Economy. 2. Better teaching. 3. Better supervision. 4. Better educational spirit.

But the growing illiteracy of the "native white population" is not to be attributed wholly to the poor work of the schools, but largely to the indifference of the people.

Let us look at the general attendance upon the schools of the state. In 1896, there were enrolled in all the schools of the state, attending two weeks or more, 63,944 pupils; the average daily attendance was 43,097; leaving 20,847 out of school every day upon the average. Where were they? Some were sick! Some legally employed in mills. Some properly and necessarily doing housework. Where were the others? Some were playing truant. Some allowed to stay out by indifferent parents. Some detained by the same kind of fathers and mothers to do work that could as well be done without absence from school. Some regularly irregular from the shiftlessness of father or mother or both.

And the good citizens of the several towns, who have paid their taxes for the support of schools as required by law, have looked calmly on, have noticed these 20,000 children absent from school day after day, and have said that they had no interest in the matter.

No interest in it? Who has, then? Schools are supported because universal education is the only safeguard of republican institutions; they are supported as a protection to property interests, to personal interests, to civil interests; they are supported by taxation upon every piece of property in the state that is not hidden, or exempted by law; and taxpayers say that it is none of their business whether they get their money's worth or not! The schools are not giving you your money's worth as long as a single child, mentally and physically able to attend school, is growing up illiterate; citizens are not doing their duty as long as they allow one single child to absent himself from school without good reason. Do you say that the parent has the right to do as he pleases? He has no such right, morally or legally. The law taxes you to educate the child, and it is your right that the child should be educated; and your duty to see that he is.

It is a disgrace to any town that an illiterate should be allowed to grow up in it, and every citizen of such town should clothe himself in sackcloth and ashes in token of his individual responsibility, and get up and hustle for a remedy. I suppose that every town in the state has at least one family, of the "poor white trash" type, ignorant, shiftless, and down-at-the-heel, usually with a troop of children who rarely see a schoolhouse, who grow up no better than their parents. Until it is made a state prison offence for such people to perpetuate their kind, it behooves all good citizens to see that the laws are enforced relative to education.

The law requires that every child between the ages of eight and sixteen years shall attend school twelve weeks every year. The law further provides that every district may make a by-law punishing all children between the ages of six and sixteen years, who, without any regular and lawful occupation, are habitual truants or who habitually neglect to attend school.

That only a small proportion of the towns have such a by-law shows the indifference of the people. Every town in the state that has neglected this weapon of attack upon ignorance and illiteracy should enact an appropriate by-law at the coming March meeting. With this instrumentality every truant is at the mercy of the school board, and may be kept in school, not twelve weeks, but the entire number of weeks your schools are in session.

MINIMUM SCHOOL YEAR.

By the report of the State Superintendent of Public Instruction, I find that the average length of schools in Carroll county in 1896 was twenty-three weeks, the lowest in the state; it also appears from the same report that the amount expended per pupil was the lowest in the state; the amount expended for text-books and supplies per pupil was also the lowest reported for any county; this rank in expenditure may mean that they exercised the greatest care and economy, or it may mean the poorest equipment; I do not undertake to decide. But the same authority also shows that Carroll county pays the highest rate of school tax.

	Text-books and supplies.	Number of weeks in the school year.	Average per capita expense, not including new buildings.	Rate of school assessment.
Belknap	$1.10	25.96	$16.26	$0.0029
Carroll	0.86	23.00	10.78	.0038
Cheshire	1.12	26.22	14.89	.0031
Coos	0.99	24.49	11.59	.0036
Grafton	1.00	23.88	13.26	.0032
Hillsborough	1.09	28.54	18.27	.0032
Merrimack	1 18	27.63	16.77	.0033
Rockingham	1.07	29.48	15.77	.0033
Strafford	1.27	28.65	16.63	.0033
Sullivan	1.19	23.49	14.86	.0031
Average, 1896	$1.08	26.13	$14.90	$0.00328

The state report shows that in one town in Carroll county the longest school is kept ten weeks in the year; in another thirteen weeks; and still another reports sixteen weeks as the maximum.

Now I submit without argument that we cannot expect a high educational standard in a town that supports its public schools no more than ten weeks per year (1895 reports nine weeks for same town), and that twenty-three weeks for an entire county is too low, when we consider that one town of the county reports thirty-three weeks.

There should be a minimum required by the state of at least twenty-five weeks in every town in the state.

The state statistics show that sixty-seven towns have less than twenty-five weeks; that forty-one towns have less than fifteen weeks; that eight have ten weeks or less, the lowest being seven weeks.

This proposition, of course, will meet with vehement opposition from every man who thinks that he is not in any way responsible for the welfare of the community; from every man who asks, as did Cain of old, "Am I my brother's keeper?" from the calamity-howler and the tax-growler. But I have endeavored to keep before you the idea that we are our "brother's keeper"; that every citizen of a civilized community has a share in maintaining the welfare and the standard of civilization and enlightenment; and that he is derelict to his duty if he fails to perform his share. But I admit at once that there are many towns in our state that have been so drained of their resources by the drift of population to the cities, and by the changes in our agriculture, that they are already tax-burdened. Depreciated value of farm property, abandoned farms on every hillside, markets made poor by western competition are arguments to the New Hampshire farmer to vote for low taxation wherever he can see an opportunity. State and county taxes must be raised; roads must be kept passable, and besides he may be elected road-agent, or at least he may get some of his money back for working his team between planting time and hoeing time, and for breaking out the roads in the winter. Where, then, is the chance to reduce expenses? Ah, the schools!

Children are few and far between; cash returns are not visible; out comes the pruning knife, and the school appropri-

ation is kept down to its lowest limit. If a citizen zealous for more education remonstrates, it is considered conclusive to point to Horace Greeley, Daniel Webster, or some other native of New Hampshire who has achieved note or notoriety, as the product of our rural schools; this settles every discussion of the kind, because it leaves nothing to be said.

I never hear this final proof of the excellence of the country school without thinking of the story of the Scotchman and his wife: Sandy was in the habit of reading the Bible to his wife and explaining the meaning of the more difficult passages. In due course he arrived at the narrative of Samson and the Philistines, where it is related that Samson caught three hundred foxes, turned them tail to tail, put a firebrand between them, and let them loose to destroy the corn of the Philistines (Judges xv, 4 and 5); when Sandy reached the "three hundred," Janet interrupted with "Hoot, Sandy, how could that be? Our Jamie is a good hunter, and he has never got more than a dozen foxes." "You mustn't always take the Bible just as it reads," said Sandy, "may be he caught fifteen or twenty foxes, and the rest were all skunks and woodchucks." My friends, very few of us can be classed as "foxes."

If my contention is correct, that the school is not a local institution, of merely local value; if it is true that education is required by the state for the state's salvation; if the safety of republican institutions rests upon general intelligence; then it logically follows that it is the duty of the state not merely to require schools of certain efficiency, and to establish a minimum number of weeks per year, but to furnish financial assistance to such towns as are willing to do all they may reasonably be expected to do, but which cannot reach the desired standard without too great a burden. Carroll county, to which I have already referred, in the comparison of counties, is an illustration of this point; if the highest rate of school taxation will enable them only to maintain their schools for the shortest time, and to expend the lowest sum per capita in the state, it would seem that the more fortunate portions of the state should share with them. The present

condition in many towns of the state lowers the educational rank of the whole state: ignorance and illiteracy are a menace to the welfare and prosperity of the whole state; the whole state would share in the benefit accruing from better schools and a higher educational standard; therefore, the property of the whole state should share the burden of administering the remedy. The cities and villages have prospered at the expense of the agricultural towns; let them now pay part of their debt, to the schools of those towns.

This proposition is not a novelty. The plan is effective in other state. Maine has a "mill-tax" of $0.001 on every dollar of assessed valuation to be paid to the state, and by the state distributed according to law. Massachusetts has a permanent school fund of $4,000,000 to be annually increased by $100,000 till it amounts to $5,000,000, the income of which is distributed annually to the small towns according to valuation to assist in the support of public schools. In several of the more progressive central and western states, the state is the absolute unit for educational taxation; you will find, by searching the school laws of such state, provision for two-mill, five-mill, and even eight and ten-mill taxation. (Com. of U. S. Report, '93-'94, Vol. II.)

It may not be amiss to note in this connection, that Massachusetts easily leads the country in diffusion of intelligence among the "native white population," according to the illiteracy statistics for the three decades already referred to.

Bills have been introduced in our state legislature for several sessions having for their object the relief of the small and poor agricultural towns, educationally; but as these bills are invariably referred to the judiciary committee where the agricultural element has not made itself felt to any considerable degree, and in which the farmers have but little representation, the plan has made but little progress.

The bills introduced under the auspices of the State Teachers' Association provided for a uniform tax of one mill for every dollar of valuation, the proceeds to be added to, and to form a part of, the literary fund; the same to be distrib-

uted to all the towns of the state on the basis of the number of schools maintained, and the entire attendance at school of all pupils. It was intended to encourage regular attendance by doing away with the absurdity under the present law in the distribution of the "literary fund" whereby an attendance of two weeks counts as much as an attendance of forty weeks; it was also believed that this bill, if enacted into law, would tend to increase the length of the schools by the double incentive of state aid and the consideration of a single day's attendance as the unit of calculation.

A bill for a similar tax presented to the '97 legislature took for a basis of distribution the valuation and population, being intended only as a means of state aid to the poorer towns; this latter bill was presented under the auspices of the State Grange. The grange has a standing committee for the current year upon whom will devolve the duty of drafting a bill to meet this issue; it is my belief that one to do the greatest good must embrace the principles of both these which I have described.

A mill-tax, the expedient resorted to by most states in meeting this issue, has been frequently endorsed by students of this subject in our state. It has been suggested by others that the railroad tax might properly be used by the state for educational purposes, instead of paying it back to the towns and cities as is now done.

Details of legislation, however, are not within my present function. First. It is my purpose, in this connection, merely to direct attention to the inequalities existing between different towns; seven weeks, the minimum, to thirty-eight weeks, the maximum, per year, is too great a variation. Also to impress upon your minds one phase of the working of this inequality, viz., the cities and villages contain most of the foreign population as well as most of the mere poll-tax payers; thus the children of the newly-arrived emigrant who is not even a citizen of the United States receives the benefit of the long school year, usually from thirty-six to thirty-eight weeks; while the descendant of the founders of the state, the

men who have made New Hampshire's history, must be content with seven weeks and upwards. Is this just? Does it show proper gratitude to the country towns for the share they have taken in the past in the making of New Hampshire? Is it right and appropriate that the country boy or girl should have fewer and poorer educational privileges than the city boy or girl, whether native or foreign born?

Second. Can these towns rightfully be expected, of their own accord and from their own internal resources, to remedy the injustice and inequality?

Third. If this cannot be expected, what is the best remedy?

Is it not your duty in electing legislators to take such questions into consideration, and to select such men for representatives as will look upon them as vital issues, men capable and willing to give them thoughtful attention?

Believing, as I do, and as I have endeavored to convince you, that our interest and duty to education is not local only, but that every citizen of the state has a measure of responsibility for every section of the state, educationally, I shall now invite your attention to certain matters not strictly rural.

I have already quoted from the illiteracy tables given by the United States commissioner of education relative to the "native white population." I now ask your consideration of the same subject as applied to all the population.

The commissioner's reports present the only tabular statements relative to this matter that are available. This authority tells us that in 1870 New Hampshire stood second in education and intelligence among all the states and territories of the United States, there being at that time only one state with a smaller percentage of illiteracy; in 1880, we had fallen to the sixth place; and in 1890, to the twenty-sixth, with only four states north of Mason and Dixon's line with a poorer standing; during the twenty years from 1870 to 1890, our percentage of illiteracy nearly doubled. Hordes of Canadian French have crowded the manufacturing villages and cities; in many places, notably the smaller ones,

the compulsory attendance laws are a dead letter. If an attempt is made in the legislature to strengthen these laws so that they may be enforced where the sentiment demands, corporation influence easily blocks it.

In 1897, a bill was introduced in the House of Representatives authorizing truant officers under authority of school boards to visit manufacturing establishments for the purpose of investigating illegal employment of children; this bill placed no additional restrictions upon such employment, but simply proposed measures which might prove effective for the enforcement of existing law; hostile influence, the source of which you may easily guess, laid the bill on the table,—and it is still there, its friends not being able to muster force enough to secure its consideration. Ensign Stebbins is very numerous in New Hampshire, "He is in favor of the law, but agin its enforcement." The result of this failure to strengthen the employment laws encourages such manufacturers as wish to evade the law, to hire whole families of illiterate French children who get not a day's schooling for years,—and New Hampshire's illiteracy goes on doubling,—and the intelligent people look calmly on and ask, "Am I my brother's keeper?"

The present laws provide that no child under sixteen years of age shall be employed in a manufacturing establishment unless he can read and write. To remove all doubt as to the meaning of this, it is proposed to add the words "in the English language"; this amendment has been adopted by two successive legislatures, and vetoed by successive governors. The inference is that school boards are expected to examine children who wish to work in the mills, in French, German, Armenian, Russian, Scandinavian, or Cherokee, as may be required.

The present laws and the proposed amendments are righteous; they are in the interest of the child, of labor, of the community, of the state, of the republic; they are opposed by the selfishness and the greed of corporations. On which side should the farmer range himself? On which side should every patriot throw his influence?

When Antipater demanded from the Spartans fifty children as hostages, they offered him instead a hundred men of distinction. The theory of the Spartans was right. But what a revolution would come to pass in the character of New Hampshire's population were we all with one accord to begin today to live up to this idea! If we should carry out the principle that the correct training and education of the children are of more importance to the state than twice their number of the most prominent men among us!

The State Grange at its annual session in December, 1897, adopted an educational platform, which I have taken the liberty to copy from the report of the committee on education of that body:

GRANGE PLATFORM.

1. We assert that children living in the sparsely inhabited rural sections are entitled to as good educational advantages as children in the cities and villages, and that the state should see to it that such advantages are furnished.

2. We endorse the special preparation of teachers; and recommend the New Hampshire State Normal School to the patronage of those wishing to teach.

3. We advocate a minimum school year of twenty-five (25) weeks for all the schools of the state of New Hampshire.

4. We recommend that the state assist the smaller and poorer towns that are striving to help themselves.

5. We believe that the truancy laws should be made more efficient by additional legislation.

6. We believe that the provision of the bill vetoed by the governor at the last session of the legislature, requiring children to be able to read and write the English language as a prerequisite to employment in manufacturing establishments, is imperatively demanded by the best interests of the state.

7. We demand a strict enforcement of the laws relating to compulsory education, and such additional legislation as may be needed to make them effective.

My friends, I have presented some facts, and given some opinions as conclusions from those facts, that are not calculated to exalt our pride. I confess that I am ashamed of

some of them; I trust that you are. But you must blame the facts, not me. Improvement must come, if it comes at all, from looking the existing conditions squarely in the face, not from ignoring them.

We are told by thin-skinned critics that unpalatable facts should be hushed up, lest the reputation of New Hampshire be injured. I yield to no man in love for my native state; and because I love her, I ask every patriotic son to unite in an effort to restore her to her former proud position as an intellectual leader.

Reputation is not character. Let us see to it that the educational and intellectual character of our state is right, and her reputation will take care of itself.

In 1848, the school committee of Pittsfield wrote: "The illustrious patriots and fathers of our republic felt that free schools were the corner-stone of our civil and religious institutions. . . . Here is a common cause where all party feeling should be laid aside, and all feel personally concerned. May we unitedly make such constant and worthy efforts to advance and elevate our common schools, that they may always be nurseries of sound learning, patriotism, and virtue."

With these words of your own citizens of fifty years ago, I leave the subject for your careful and prayerful consideration.

THE BOARD OF AGRICULTURE.

HON. MOSES HUMPHREY, CONCORD.

It gives me great pleasure to meet with you on this occasion, and as it may be the last time in an official capacity, I desire to briefly address you. My term of office as president of the Board of Agriculture has been twenty-seven years, and I have found enjoyment in the work. I have been treated very kindly and with great respect by my agricultural friends. My early associates on the board, with a single possible exception, have passed away, and even he, if living, resides outside the state.

In June, 1870, James O. Adams, member of the house of representatives, and Moses Humphrey, a member of the governor's council, both being identified with the agricultural societies of the state, conceived the idea of a State Board of Agriculture, believing that great benefits would come to the agricultural interests of the state from such an organization. They presented the subject to the legislature then in session, and the bill creating the Board of Agriculture was passed and signed July 2, 1870. One of the sections of said act provides that the members of the board shall receive no compensation for services, but shall be entitled to their legitimate expenses. Thus you will see that the members of the board take great interest in the advancement of agriculture in the state, in giving their services for the purpose of stimulating, the young farmers especially, to more progressive and successful management of their farms.

Secretary Adams was of great assistance in the organization of the board and its work, and was enthusiastic in the farmers' cause to the time of his death, which occurred in 1887. The board was fortunate in the selection of N. J. Bachelder of Andover as his successor, a competent man, and one whose heart is in the work, and who has done more to elevate the cause of agriculture than any other person in the state. We have had valuable assistance from outside the

board on various occasions, but I will refer to only one, the Hon. Joseph B. Walker of Concord, who has rendered valuable services in the interest of agriculture at many of our meetings and institutes. Many other citizens of the state, and some from outside, have contributed without compensation to the work of the board by lecturing at meetings and institutes. Very few paid lecturers have been employed, so the work has cost the state a very insignificant sum compared to the benefit conferred upon the farmers by this work.

The first meeting of the board was held in the council chamber at Concord, August 23, 1870, and organized by choosing Moses Humphrey of Concord, president, and James O. Adams of Manchester, secretary. A discussion of the duties of the board was had, as the act establishing it was not very explicit. The first work was in connection with the agricultural fairs of the state, which were attended by delegates from the board, and farmers' meetings held in the evenings. These were so successful and helpful to the farmers that it was decided to hold a series of farmers' meetings in the state during the winter season. These were assigned to different sections of the state, and have been continued to the present day, being now called institutes. The board has held meetings of this character in the counties of the state as follows: Rockingham, 50; Strafford, 42; Belknap, 44; Carroll, 41; Merrimack, 68; Hillsborough, 48; Cheshire, 51; Sullivan, 57; Grafton, 65; Coos, 72; making a total of 539. I have attended in my official capacity 421 of these meetings, besides about forty other meetings of the board, including business meetings and others of various nature. I have enjoyed these meetings, for I have faith in them. While we have contributed our services, we have had the satisfaction of knowing that we were aiding the farmers in all departments of agriculture, and great results have been accomplished for them.

At the time when the early meetings of the board were held, little was known by the farmers in general about the characteristics of the various breeds of cattle. Any farmer's

boy in the state now knows the different breeds and the special adaptability of each to different purposes. The same lack of information existed in regard to farm crops. It was also quite generally believed that corn could not be profitably grown in the state to compete with the West, but through discussion and agitation of the subject at farmers' meetings and institutes, it is now generally conceded that corn can be grown at a profit in New Hampshire. At a farmers' institute held in Bedford I was approached by a farmer who said that he was present at a farmers' meeting held there by the board twenty years before, and heard the discussion of growing corn, and the statement that it could be grown at a profit. He said he went home and put in practice the ideas advanced at that meeting, and since then had grown his own corn, and his neighbors were doing the same. His claim that the fodder on an acre of corn when intelligently planted, cultivated, and harvested will pay the cost of growing, is substantiated by the facts. With improved machinery, corn can be grown at a good profit in our state today.

What is true of corn growing is generally true in regard to other crops. Especially is progressive action necessary in the business of dairying, now one of the most important agricultural interests of our state. Our nearness to market gives us an advantage over the West in this matter. No section of the country excels New Hampshire in the opportunities for establishing healthy, happy homes, and no section of the country has contributed a greater share of able men to build up and develop other interests and other sections than has the old Granite State. The hard, rugged soil of our state has developed such habits of industry in the people as to insure their success in whatever work they may engage. Their education was practical and useful. There is a great demand in our cities for country bred young men and women, and it is upon them that the future of this country depends. Whatever tends to develop their interest in the farm, and renders farming more profitable, will tend to keep more of these people upon the farms, thus increasing

the influence and prosperity of rural sections. We consider the work done by the board of agriculture in this direction one of the most important things accomplished.

In leaving the board and many friends in farming communities, I do it with great regret, but on account of my age it seems a necessity. My interest in the board and its work will continue as long as life remains.

GOOD ROADS INSTITUTE.

GOOD ROADS INSTITUTE.

In accordance with the vote of the Board of Agriculture at its special meeting in Concord, which action seemed fully warranted by the good results growing out of the Concord meeting of a similar nature in the spring of 1896, a "Good Roads" institute was held in the city of Keene, on Tuesday and Wednesday, May 17 and 18, the local arrangements having been perfected by Willard Bill, Jr., member of the Board for Cheshire county, with whom Mayor Eames and the Keene city government cordially and heartily co-operated.

The city hall was used as the place of meeting, and the opening session was called at two o'clock P. M., on Tuesday, President Walker in the chair. The first exercise was a finely rendered song by the choir of Cheshire Grange No. 131, Patrons of Husbandry, of Keene, one of the best musical organizations of the kind in the state.

Hon. George H. Eames, mayor of Keene, delivered an appropriate address of welcome, of which the following is an abstract:

MAYOR EAMES'S ADDRESS.

Mr. President: It gives me sincere pleasure, in behalf of the city of Keene, to welcome you and your associates of the Board of Agriculture, and the able speakers engaged for the occasion, to our midst, and we thank you most sincerely for selecting our beautiful city as the place of this meeting, held for the promotion of an object of such vital importance to all sections of the state, and in which the people of Keene are deeply interested.

Proceeding, Mayor Eames complimented the Board of Agriculture upon the good work already accomplished in the

state, in the line of highway improvement, under its auspices, or through its instrumentality, and dwelt upon the importance to every community of persistent and systematic labor in that direction. The list of speakers announced for the meeting was ample guaranty, he said, that profitable instruction would be afforded, and, although there might be disappointment in the fact that General Stone of the Good Roads Inquiry Bureau at Washington, having been ordered into active service by the government, "at the front," for the purpose of taking charge of the construction of such military roads as may be required in the invasion of Cuba by the United States forces, is unable to be present, there was satisfaction in the assurance that his place would be filled by a competent representative.

Among the leading factors which come in to give paramount importance to the good roads problem in the present day, particular mention was made of the bicycle interest, whose increasing magnitude from year to year cannot be ignored. It is manifest, said the speaker, that in the future our roads must be constructed with reference to the better accommodation of wheelmen, who even now constitute the greater portion of the entire body of travelers upon the public highways in our more thickly settled communities. Special reference was also made to the summer boarding interest, and the large and yearly increasing number of people who come into the state every summer from the great cities, and other portions of the country, for a season of pleasure and recreation, leaving large amounts of money among our people. Riding and driving in the midst of the beautiful scenery which the state affords is one of the chief objects of their coming, and in this age of general highway improvement New Hampshire must at least keep pace with other states in that line, in order to insure the continuance and increase of this very important source of revenue and resulting prosperity.

The city of Keene, the mayor said, has long been interested in the matter of improving its own streets, and has been

laboring to that end with fairly good if not the best results. It has been favored in having the services of a good civil engineer, and during recent administrations good progress has been made in the work of macadamizing and making other improvements. What is wanted, here and everywhere, is to learn how to make a certain amount of good permanent road each year to the best advantage and at the least expense, and to keep the same in the best condition at all seasons. To show how this can be done is the object of this institute; and, certainly, a long step has been taken in the right direction when the Board of Agriculture takes up this work and pursues it with the intelligent purpose evinced in the arrangements that have been made for this occasion.

In closing, he reiterated a hearty welcome, and the thanks of the people and city government for the presence of the Board and its co-laborers, and a purpose and desire to co-operate earnestly in promoting the work in hand.

PRESIDENT WALKER'S RESPONSE.

Responding in behalf of the Board to Mayor Eames's words of welcome, Hon. Joseph B. Walker, President of the Board of Agriculture, said:

Mr. Mayor: In behalf of the New Hampshire Board of Agriculture, by which this annual institute has been established, I thank you for your kind greeting, and assure you that it is as gratefully received as it has been generously given. And, in its reception, the Board is not unmindful of the importance of the community which has tendered it.

New Hampshire has many fair towns and cities, and Keene is the peer of the best of them. Beautifully set in this fair valley, it is a fine type of our choicest New England municipalities. Your ample streets, your churches and schoolhouses, your attractive residences and business structures, your important industries and the high character of your population, all combine in the declaration that life has here attained a lofty ideal, and that many times fortunate are they who are numbered among its inhabitants.

The portraits upon these walls remind me that your city has an important past as well as a prosperous present. If I may not, on this occasion, mention the names of persons now prominent among you, I may, I think, be allowed to recall a few of those now dead. The reputation of your, yes, the state's Gen. James Wilson is national. Among the early great surgeons of New Hampshire was the older Dr. Twitchell, and, if I may be allowed a remark strictly personal, I will say that, among the fortunate occurrences of my life, was a long association with his nephew and successor, Dr. George B. Twitchell, recently deceased among you, who was for forty years one of the trustees of the New Hampshire Asylum for the Insane, and for more than half of that time the president of their board. Three times has Keene given to New Hampshire able governors, twice in the persons of the elder and the younger Dinsmoor, and once in that of Samuel W. Hale. Prominent among the clergy of the state stood for a generation your Dr. Barstow, and in high rank among its civilians your Salma Hale, Levi Chamberlain, Thomas M. Edwards, William P. Wheeler, Francis A. Faulkner, and others who have honored your fair town.

But I must forego fond remembrances, and recur to the object of this meeting. We have assembled to discuss a subject of much importance to New Hampshire, that of good roads, and with a view of doing something to awaken in its behalf an interest similar to that existing in many of our sister states. Its avenues of travel and transportation afford a fair index of the civilization of a people. Paths two feet wide, made by the tread of the moccasined feet which once followed our principal streams and mountain passes, were conclusive evidence of the prevalence of Indian barbarism. The rough highways which our forefathers cut through the woods from one locality to another, during the progress of settlement, proclaimed the early hardships which they endured while acquiring for us a comfortable inheritance. The discussions in our legislature in the early part of the century upon the importance of turnpikes, for which no less than fifty-eight

charters were granted between 1798 and 1850, were conclusive proof of an increasing wealth, and of an extending agriculture, which was requiring better facilities for the transportation of its products, and of the commodities received in exchange therefor.

I think it may be asserted with little fear of contradiction, that the highways of a country are quite accurate indicators of the social elevation of its people. And is not the converse of this proposition also true? Can civilization obtain a high elevation, or a country high prosperity, without good roads?

Three important questions just here and now claim our attention:

1. How shall the highways now required be best constructed?

2. At whose expense shall they be made and subsequently maintained?

3. Under what supervision shall they be built?

We are fortunate in having with us on this occasion able specialists, who from careful study of the subject and broad practical experience will give us luminous answer to the first.

The second we must answer for ourselves, and, in so doing, assume at the outset that the days of turnpikes and toll bridges in New Hampshire are gone forever; that our highways must be free; that the people of this day cannot stop to pay toll, and that the expense of highway construction and maintenance must be generally borne by the tax-payers of the localities whose inhabitants they mainly serve. Our national highways have passed into history, and state highways are not yet in vogue.

In answer to the third, it may be said that money alone will not secure good highways. If it would, our present roads would but little resemble those we have. The careless stupidity with which much of the money raised for highways has been wasted must be incredible to one not conversant with the fact. The proper construction and maintenance of a good highway require not only an adequate expenditure of money and physical power, but of road-making skill

as well. Whenever the office of highway surveyor goes, regardless of qualifications, from one to another in turn, throughout a district; or, when in larger communities, road commissioners receive their appointment on account of political "pull," poor roads must be expected.

While the remark that the cost of highways must be mainly borne by the people whom they mainly serve is true, good roads are sometimes imperatively called for in localities where the population is sparse and unable to make and support them. In such cases, this state has been wont for many years to lend its aid. At its last session the legislature appropriated the sum of $13,150 for this purpose. The aggregate expenditures by the state in aid of highways, during the last twelve years, amount to $81,399.77, an average of $6,783.31 per year. How far it may be wise to vary that amount in future years, it is for that body to determine.

We will now proceed to the work of the session. It is hoped that the several addresses to be presented for your consideration will be followed by a free discussion of the views therein set forth, and at such length as the time at our disposal will allow.

Following another song by the choir, President Walker introduced as the first regular speaker of the afternoon, Prof. C. H. Pettee of Durham, whose name is familiar to many as that of one of the early instructors in our State Agricultural College, and whose services have been continued in connection with that institution since its removal from Hanover, who has also taken a deep interest in the subject of highway improvement for several years, and who has made some practical experiments in that line, announcing as his subject, "The Construction and Repair of Country Roads," who spoke in substance as follows:

PROFESSOR PETTEE'S ADDRESS.

After touring through Europe with a wheel or otherwise, and noting the magnificent systems of public roads everywhere present, one is apt to grow impatient because so little advance

is made in this line in our own country. On the other hand, the more we investigate the more serious do we find the problem to be, and while we urge enthusiasm, modern machinery, and progress we ask more for that enlightened public sentiment which shall demand and obtain a general knowledge of approved methods and a steady, persistent adherence to the plan of doing some permanent work each year with the expectation that after a long siege the battlements of poor roads will yield to assault, and that the next generation, at least, may avail themselves of the blessings sure to follow the building of improved highways.

The cities and large towns will take care of themselves. They are already making fair progress, and in a few years will have a completed system for their city and village districts. It is to be noted, however, that it would be difficult to find in New Hampshire today a half dozen pieces of macadamized road outside of residential districts. If our wealthy towns have not yet been able to extend their permanent roads into the country, even when the traffic is unusually great, is it strange that the country towns do not lead off in building such roads? Let the cities macadamize to the adjoining town lines, and the smaller communities will find means to carry forward the improvement. Fortunately these country roads, when they come, will prove less expensive to build than those within urban limits. Country roads do not have to be brought to a certain grade regardless of expense, and they need not be macadamized from curb to curb. Oftentimes a narrow width of crushed stone with a good dirt track on one or both sides is ample, so that on the whole, if the road is properly laid out at the start, the total expense may be from one third to one half that of the city street.

While the macadam is the type of permanent roadway, it is not my purpose to elaborate that type further, but rather to speak of some of the means that may be adopted to improve our highways with the appropriations at present at our disposal.

1. Some work, even if only a little, should be done each year to improve grades. Our roads have never been properly

laid out, and there is no form of improvement that arouses so much opposition as re-location. In very many cases suitable grades can be attained only by such re-location. Every improvement of grade carried out now will lessen the annual expense for repairs, and will be a step toward the future permanent roadway.

2. The roadbed should receive careful attention. It must be properly drained or no permanent road is possible. It must be properly shaped, about the same as the traveled way above it. The kind of material used for roadbed is practically unimportant, because in ninety-nine cases out of one hundred the material at hand is the best that can be afforded. The road machine is an excellent machine for cheaply grading the roadbed, and its use for this purpose is legitimate. For our main thoroughfares the road machine should be used only once—except possibly for a little smoothing—and that to shape the roadbed. The great trouble with the road machine is that after its use the road is considered completed, when it is not yet half done.

3. Many towns have learned the lesson of surfacing, and others are fast following their example. This should follow the shaping above referred to. If the road is to be macadamized we are now ready for the crushed stone. If a cheaper substitute is necessary, gravel is most commonly used. Clay is sometimes drawn upon sandy roads and sand upon clay ones, though coarse gravel would be better than sand in the latter case. Good results may be attained and the roadway much improved by putting on only one load of good gravel every twenty feet, provided the subsoil is not sandy, in which case it is economy to put on more at a time. After graveling is begun, enough should be put on from time to time to keep the surface good and the shape of the road crowning. The road should never again be torn to pieces by the road machine or plow. If, however, enough gravel has not been put on to hold the material underneath, the original process will have to be gone over a second time, and much of the work already done will be lost.

We find in almost every town in New Hampshire numerous drift deposits of gravel and sand, varying from huge bowlders to the finest sand. The rocks have usually been rounded by the action of water in a past geological age, and for this reason and others are not the best material for road surfacing. However, the very general distribution of this material and its consequent cheapness has impressed me with its importance as a road surfacing material. Throughout this state the most of the rock found in such deposits is granite, which is so brittle that as a rule it breaks up easily under traffic, and thus the rounded edges seem to work together almost as well as when sharp.

I have experimented recently at Durham with this material. The secret of its successful use seems to consist in proper screening. Coarse rocks were used first, a layer six inches thick being thoroughly rolled into place. Then came about three inches of small rocks, and finally a thin layer of finer ones on the surface, perhaps one half inch thick. For this layer some of the sand screened from the gravel was used, a little clay being mixed with it to give it suitable binding power. It will thus be seen that I have a complete macadam road out of home materials at small expense.

It is my experience that we often use too fine gravel for durability. The fine shovels easier in the bank and so the better material is passed by. By proper selection, even without screening, good results may be obtained, but keep the sand out and the rocks in for best results.

On clay roads the best union of clay and gravel is attained by putting on the gravel early in the spring or late in the fall. In either case, as the frost comes out of the ground the gravel goes in, and after drying out a very firm surface is obtained, which, if sufficiently graveled, will remain dry and hard through successive spring seasons.

CARE OF ROADS.

We must in some way secure a longer period of service than one year for our highway agents. How this is to be

brought about is for the legislature to say, but some change in this direction is most essential.

Again, it would seem to be equally desirable to have only one highway agent in each town, whose duty as well as privilege it should be to appoint sub-agents or section men to have charge of not over four miles of road each. They should make necessary small repairs as needed, should keep the roadway free from loose stone, should prevent washing of the hill roads, should keep culverts and ditches clear, and should break roads in the winter. They should be under the direct control of the highway agent, and should be removable by him for cause. They should make frequent reports to their superior and should be limited in the amount of their expenditure. All permanent work, as well as larger repairs, should be carried out under the direct supervision of the highway agent or of some one selected by him.

Instead of working all the roads in a skimming fashion each spring until the appropriation is practically exhausted, the work should be largely concentrated upon the worst places and upon the best. Upon the worst with the determination to make them the best, and upon the best with the intention of doing just enough to hold them in shape and keep them the best. A stitch in time always saves nine in keeping up a road. If this policy is pursued for a few years intelligently all roads will become alike good, the expense of annual maintenance much reduced, and more time and money left for permanent improvements.

The condition of the back roads in many of our small towns is discouraging. If, however, the main thoroughfares are systematically improved, we can safely leave to the owners of property the renovation of such back roads as ought to be rebuilt. The farmer who can reach a first-class main highway within, say, two miles of home will be compelled by self interest to give some of his more leisure time, such, for example, as used to be put into building stone walls, that have proved largely an encumbrance, for the permanent improvement of his local road. If we reckoned up the cost of all the stone walls in

New Hampshire, we should say it was impossible for them ever to have been built, but they have been built. So with our roads, even the back ones. Persistent work will count, and in the end we shall find the value of the back farm will depend very largely upon the character of the road leading thereto.

HON. J. O. SANFORD'S ADDRESS.

The second and last speaker of the afternoon was Hon. J. O. Sanford of Stanford, Vt., a member of the Vermont Board of Agriculture, who gave an interesting, practical talk upon the "Care of Highways," which is summarized as follows:

In opening he expressed his satisfaction in being present and co-operating with his brethren of the New Hampshire Board of Agriculture in the prosecution of a work of whose importance too much could not be said, and in whose furtherance it was gratifying to see so much being done. As regards the cities, said the speaker, I have no concern. They will take care of themselves in this matter. My great concern is about the country towns, where there is so much necessary to be done, and where the means at command are so limited. The only way out of the difficulty is to abandon entirely the old methods, which involve constant labor and expense in the matter of repairs, entirely without system and of no permanent value, and adopt the modern plan of constructing good roads that will not require repair, or, rather, which may be kept in repair by the exercise of intelligent care. The old district system is the most extravagant possible, and should not be tolerated anywhere.

In the state of Vermont, largely through the influence of the late lamented Gov. Fuller, who was an enthusiast upon the subject of good roads, much progress has been made, the legislature having enacted a new highway law in 1892, wiping out the old system, and providing for the election of a single highway commissioner in each town—a plan which

avoids all division of responsibility and consequent inactivity or waste of effort. The year after this change in the law was effected the State Board of Agriculture took up the subject of good roads and made it one of the topics to be considered at all its meetings. It was also made a point at all the meetings to ascertain as accurately as possible how the change is liked by the people in the different towns, and what results have been effected. As a rule, the testimony is to the effect that the highways have been improved at least fifty per cent, and often much more. Then inquiry is instituted as to how this has been done. Almost invariably it has appeared that the bulk of the work done under the old system had been in repairing damages occasioned by neglect. Stopping the neglect has remedied the trouble. It is found that, as a rule, good commissioners have been secured, and the best results of all are noted where the same commissioner has been continued in office right along. The Vermont Board of Agriculture feels, therefore, that the road question for that state has practically been solved. A regular business system has been adopted, just the same as has all along prevailed in the care of the railroad lines of the country, which, when once built, are continually taken care of. Every rod of a railroad is under the eye of a trusted man every day, and kept constantly in repair. The highway commissioners in the Vermont towns proceed upon precisely the same principle. How to get good roads in the start is the first question naturally asked, but the first thing to be done is to take care of what we have, and that can only be done by having a competent and thoroughly responsible man in charge.

The speaker proceeded to illustrate by referring to his own work as commissioner in the town of Stanford, where he resides, he having held the office there since the first year after the change in the law, the man first chosen having declined to take the office the second year. Immediately after my election, said he, I laid out a plan of operations, dividing the road in the town into sections, and selecting the

best man obtainable to take care of each. I then had a serious talk with each man selected, telling him just what I desired to have done. Every one was instructed to go carefully over his section, commencing before the snow went off, and cut out the ditches, so as to keep the water off the highway as generally as possible, and follow it up as often as necessary to prevent all washing of the highway. Then, as soon as the frost was out of the ground, each was instructed to cart on gravel and fill up the mudholes, wherever found. On the main line of travelled highway leading through the town, six miles in length, a good, faithful man was employed and kept constantly at work through the season, beginning the middle of May. His instructions were to go over a mile of road a day at first, filling up holes and remedying the worst defects, picking out the stones, etc. This was followed up through the season, at a total expense for man and team of $250, whereas, ordinarily, under the old system, the annual cost of repairs for that section of road had been from $600 to $1,000. There was grumbling over the plan adopted at first, but before the end of the season everybody was satisfied, and the road was in better condition than ever before.

The old plan of having a large gang of men and teams go over the roads for a few days late in the spring, after planting is done, and they have been washed to pieces and gullied out frequently for long distances, is a most extravagant one. Every piece of road should be under some one responsible man's care from the start, the water kept out and the defects remedied as fast as they appear. Neglect has been the great trouble with the country roads. Every hole or washout should be attended to at once, and a vast amount of labor thereby saved which otherwise would be required later on. The mudholes or quagmires that appear every spring in the highway, in many places, should be dug out and the places filled with stones—not dumped in but packed in carefully—and then covered with gravel. In this way they will be permanently gotten rid of. By pursuing this system of constant care and attention on the part of care-

fully chosen men, stopping the annual indiscriminate scraping of mud into the road, but all the time keeping the water out, constant improvement in the highways has become perceptible.

The Vermont law, said the speaker, provides for state aid for the rural towns, to some extent, in keeping up the highways, five per cent of the annual state tax being divided among the towns according to mileage. This the law required to be expended in permanent work, in either of three different lines: First. In building stone roads, through which pieces of highway that four or five years ago were utterly impassable in mud time are now in fine condition at all seasons. Second. In making gravel roads. Third. In constructing culverts, which are made wide and deep so as to accommodate the water flow at all seasons, built substantially, with wide stone coverings, a layer of small stone over these carefully packed down and then covered with gravel. By pursuing these methods progress in the line of good roads has been made in Vermont, and there is hope for the future.

The winter care of roads was briefly touched upon by Mr. Sanford, and the necessity of cutting away the bushes and removing the fences and other obstructions that cause drifting of the snow was duly emphasized. By pursuing this plan he had lessened, many fold, the cost of winter care of the highway in his town. In closing he referred briefly to the subject of wide tires for road wagons and carriages, by the adoption of which a vast improvement can be made. While their use cannot be compelled by legislation, the constant agitation of the subject, and the presentation of the advantages resulting from the same, will ultimately induce their very general adoption, just as constant discussion and agitation along all lines, direct or incidental, relating to highway improvement, is inevitably productive of good.

EVENING SESSION.

The Tuesday evening session opened at eight o'clock, with music by the choir, which had been strongly reinforced for the occasion, and which sang with fine effect.

In introducing the leading speaker of the evening, Prof. J. D. Quackenbos of Columbia University, a summer resident of the town of New London, President Walker referred to the great importance of the summer boarding interest as a source of the state's prosperity, and announced that the speaker would discuss the subject of good roads in its relation to that interest. Professor Quackenbos spoke as follows, for nearly an hour, holding the delighted attention of the audience throughout:

PROFESSOR QUACKENBOS'S ADDRESS.

Mr. President, Ladies and Gentlemen: When Mr. Bachelder asked me to select a text from the Gospel of Good Roads and speak therefrom to this institute tonight, he was doubtless aware that my remarks must naturally take the turn of criticism and economic discussion rather than be based on a scientific acquaintance with the Telford or MacAdam systems of construction, or on any special ability to extend advice as to practical measures for the betterment of our highways. It were easy to expose the worthlessness of the present method of road building and repairing; virtually a mere make-shift whereby men work out their taxes on the roads, not by any means with the same energy displayed in their own hayfields a month or two later—whereby shirking and hence dishonesty is fostered in every community, and money is wasted because ignorant and incompetent men are placed in charge of this most important interest, and local circumstances are allowed to determine the course of roads, whether over the worst hill in town or through the sandiest and swampiest land.

It were easy to show you that the attention devoted to its highways is and has always been in direct proportion to the civilization of a given country—true, from the grey dawn of history, when traders of the Euphrates and the Nile exchanged their commodities through the medium of famous roads that connected the Egyptian Memphis with Damascus,

Babylon and Nineveh—from the days when the fair-complexioned Indo-Aryans drove from village to village in wheeled carriages over well-constructed Bactrian highways 2000 years B. C.—and Xerxes, the exponent of Persian monotheism in a later age, launched against Europe the largest armies ever raised by man, availing himself of military roads that were a necessity of the ancient world—or from centuries still nearer to us wherein the greatest road-builders of antiquity tied the heart of the mighty Roman Empire to the remotest provinces by the most magnificent system of highways the world has ever seen, highways that have defied the wear of twenty centuries and are utilized by man today. It has been well said that the character of a nation's roads is a good test of its civilization.

It were easy to demonstrate the advantages accruing to our railroads if better wagon roads existed as feeders, and to draw the conclusion from such a showing that the railroad companies should be liberally taxed to keep the carriage roads in repair.

No one can doubt the economic importance of good roads, and MacAdam defined a good road to be an artificial floor forming a strong, smooth, solid surface, at once capable of carrying great weight, and over which carriages may pass without meeting any impediment. You may remember that MacAdam introduced into Britain in 1816 a roadbed of crushed granite twelve or fifteen inches thick, costing $5,000 a mile, about twice as much as a dirt road; but when such a road is once laid the expense of keeping it in repair is comparatively small, while the saving in units of labor, in wear and tear of horse, harness, vehicle, and patience, in time and distance, increased opportunity for transportation and travel, and lessened cost thereof, is simply incalculable. Wagons and carriages that are jolted over rocks and forced through deep mud and sand last but half their time, while carrying from one half to one quarter of their legitimate load. Gilmore, in his "Practical Treatise on Roads," demonstrates that any kind of the better class of permanent roads would enable

a team to draw on a level four times the amount drawn on a common earth road such as we have. Good dirt roads would reduce the cost of transportation over our highways at least one half. You who have lived in New Hampshire through the last winter and spring can, perhaps, make an estimate of the losses you have sustained in time and labor, and, therefore, in money, that are directly assignable to our execrable roads.

Prof. Richard T. Ely, a student of mine at Columbia, now Professor of Economics and Political Science in the University of Wisconsin, estimates that poor roads cost the farmer $15 per horse annually. As there are some 75,000 horses in this state, the yearly expense of traveling over our roads, on which we are obliged to spend a great deal of time, is $1,075,000 in excess of what it would be if the roads were good. In addition to this, bad roads keep the horses idle. It is well known that the English horse does twice as much work as the American horse, not because he is a better horse or better fed, but because the English roads are better than ours. In Europe a farmer thinks nothing of drawing a load twenty miles to market. The rule in France is four tons of hay to a load for three horses. I have been astonished at the weight a single animal will carry with ease over European roads, those of England especially. In Lancashire, where cotton is king, about Wigan and Blackburn, as well as in the neighborhood of London, Oxford, Southampton, and Plymouth; in Scotland, where streets just wide enough to admit of the passing of vehicles wind between hawthorne hedges; even in misty Skye and the remotest islands of the Hebrides,—the highways everywhere attract attention for their hardness and smoothness. Great care and expense are lavished on the Highland roads because of the interest in summer travel. The people are supported by tourists. Roads that lead to settlements of crofters' huts—the whole house not larger than one of our rooms, built of stones and mud and roofed over with straw and soil, which is tied down by ropes, and on which crops of oats flourish—with cattle, Highland ponies, and barefooted

children warming themselves within at the eternal fire of peat—the roads, I say, that lead even to such settlements, put to the blush the finest highways in the state of New Hampshire.

So beautiful are the roads of the Isle of Wight, blossom-painted lanes, flanked by neatly trimmed, bright green hawthorne hedges, six feet high, backed by the dark enameled foliage of holly trees four feet taller, with ivy-covered houses, and nightingales singing in every bush—a dream of peace and restfulness—such is the charm of these roads that people of taste from all parts of the world resort there to walk upon them and admire.

Great Britain would seem to carry the principle into her colonies. Nowhere in the world have I seen roads more ideal than those of the Bermudas; made of shell limestone, as smooth as silk to the bicyclist, as soft as down to the invalid. I need hardly occupy your time by asking you to accompany me over the brick-paved streets of Holland, the perfect highways of the castled Rhine, the magnificent Swiss turnpikes that lose not their characteristic antagonism to jolts and jars even at altitudes where in July you can make snowballs with one hand and pluck with the other wild pansies that owe their singularly brilliant tints to the ammonia of the melting snows. I need not stop to construct for your delectation word pictures of the Italian coach-roads that wind down the slopes of ragged mountains, over kulms where the August lightnings cast a violet glare on walls of everlasting ice, through village streets cobble-floored to valleys where the Spanish chestnut, the almond, and the fig-tree flourish in the open air. I need not lead you over the roads in France, from the rural by-ways that intersect the limitless vineyards of Burgundy to the matchless boulevards of Paris. Everywhere we should find the same importance attached to good highways, the same care expended in their construction and maintenance.

All this would not be done if it did not pay from the economic standpoint. Without these roads the entertainment

of summer travelers would cease to be a lucrative business, and tens of thousands of people would be thrown upon the world without an occupation. Your roads are cut; the great expense connected with their construction has been already met. Do any of us realize the vast amount of capital already invested in them? Do any of us know how many acres of desirable pasture, ornamental, and arable land have been set apart in our own towns for purposes of travel, and what is their value?

Can any of us guess the amount of money that has been sunk, wasted, in keeping up these roads during the century or more of their existence? I will wager if we had that amount to modernize our roads today, good roads institutes would be unnecessary. Think, then, of the property interest we have in our existing highways to protect. We can best do it by making them perfect at once. Thus we shall turn this Switzerland of America, as it has been appropriately called out of compliment to its natural sublimities, into a veritable Switzerland, for Switzerland without its admirable road system would be an unknown and unvisited land.

No longer ago than Saturday last, I was among the mineral bearing ledges of Springfield and Grafton, studying the economic geology of this phenomenally rich section—rich in tourmaline, beryl, amethyst, garnets, rose and smoky quartz, and the finest mica in the world—so rich that Tiffany & Company of New York, the foremost jewelry concern in the United States, has commissioned Mr. John L. George of Springfield to collect specimens of its gems, with a view to instituting mining operations there—so beautiful in its forest-covered mountains, tenanted with deer, its deep ravines through which troop tumultuous tributaries of the Smith River, its lonesome lily ponds, its dense cathedral groves, and its unrivaled distant prospects—so attractive to the student in its glacial phenomena, the caverns hollowed in its cliffs, its lenticular hills and granite domes, its plant and bird life —the healthiest region in the state of New Hampshire, fifteen hundred to two thousand feet above the sea, with the

purest of water and the most bracing of air, where people die almost entirely the euthanasia of age—a dreamland of ecstasies to one just escaped from the midnight labor, the bustle and smoke and war excitement of the second city of the earth.

But everywhere is the deserted farmhouse, with its creeping woodbine and its clump of lilac bushes—alas! in a state of elemental dissolution, slowly becoming a part of the wild nature around it, pathetic in its loneliness and lingering death!

And I asked myself, why is this? Why are these farms deserted in this rich mineral region, whose mica is demanded in hundred-ton lots, and whose beryls are sought by gem experts—this most beautiful of all the countries God has made—why this solitude and silence, and I turned to the roads for my answer. Roads did I say? Beds of rivers, boulder-strewn, ledgy stairways which only trained horses can descend with empty vehicles, and over whose steps tumble infant streams with derisive laughter. Picturesque but not passable. Life in this divine country implies isolation. Man being a sociable animal revolts at the idea of solitary confinement, and hence has sought a more congenial locality where he can communicate through the medium of passable highways with his kind. This is my explanation of the fact that so many sections of New Hampshire, more highly favored by nature than any regions I have visited abroad, are today without inhabitants, wasting their sweetness so far as human appreciation is concerned. Bad roads are driving your people into the cities, even at the expense of an exchange of the independence that life on these hills implies for the discomforts and social slaveries of urban existence. This is one of the principal reasons why your sons and daughters are so ready to spread their wings for the centres of population. Young people love social intercourse, which good roads promote, hence good roads reconcile them to a life in the country, roads that can be traveled with reasonable speed and comfort in all kinds of weather. Such roads mean opportunities for self-culture as well as for social pleasure. Such

roads, by bringing cities and villages into closer contact with our farms, facilitate attendance at lectures, business and fraternity meetings, and evening entertainments.

Such roads are synonymous with church privileges. Finally, such roads connecting the farmhouse with the district, high, and normal school, are a condition of American education. So in their effect as elevators of the whole intellectual and esthetic tone of rural New Hampshire, good roads must tend to keep the young people on your farms, and surround you with a happy, well educated, and above all, a contented household. And I cannot lay too great stress on the importance of keeping an intelligent, young American population on our farms. It is the salvation of New Hampshire. It attracts outsiders, men and women who have money to spend. It is the staying power. It beckons summer boarders from the cities, who, finding a pleasant, refined, and perhaps literary atmosphere in the New Hampshire farmhouse, prolong their visits into the late autumn in preference to housing themselves in city flats, and so add materially to the income of the farmer and his family. The news of such exceptional advantages spreads rapidly among the towns and cities south of us. The boarders return another season with their friends. The farmer is obliged to increase his facilities, and shortly finds his business sufficiently profitable to justify the expense of a higher education for his children. Good roads will be responsible for the transition from unpainted, tumble-down tenements to pretentious summer resorts, with a regular paying city patronage, so there can be no exaggeration about the feeling that this movement toward good roads is one of the most important of modern social reforms, involving in a special degree the agricultural interests of this state.

Remember, further, that good schools and good roads to those schools, are the two great factors which in this age attract and hold a population. Not only is the road from your barn to the nearest market an essential part of your equipment as an agriculturist—the road from your sitting-room to a good school is indispensable to the fulfillment of your ob-

ligation to leave as a legacy to society a family of children thoroughly instructed not only in matters scientific and literary, but in the duties of American citizenship.

Given good roads and good schools, and your farm values will rise at a rate that will surprise you. Thoroughly drained roads, passable in winter and spring, so the children can attend school with safety, and folks can afford to be neighborly, will add ten to twenty dollars to every acre you own. Farmers will grow richer, mortgages smaller. Neighbors can be visited in any weather, and all the advantages of a city residence may be enjoyed in connection with health, good air, wholesome food, and freedom of the country. Since, then, good roads save power, shorten distance, economize time, insure comfort and safety, attract population, stimulate business by cheapening freight rates, encouraging traffic, and developing the country, elevate the social and intellectual tone of the community by bringing church, school, lecture hall, and postoffice in close touch with the farm, make possible a communal life, thus robbing winter of its gloominess, and enchance farm values while materially reducing the tax rate, because costing the least to maintain—surely the character of a country's roads is as good a test of its common sense as of its civilization.

But our roads must be more than good if we are to re-populate our abandoned farms with the wealth and refinement of the nation. They must be beautiful as well. People are waking up to the beautiful side of life, thank God. Beauty has already sold not far from a thousand of your New Hampshire farms, some of them at twice and three times their appraised values. By beauty I mean a true quality incapable of analysis but appreciable by a mode of perception, and perfectly real to the perceiver. We cannot define it, but we can realize that it means thought or feeling uttered in some perfect form by the divine reason or the imagination of man. It is the manifestation of an esthetic idea. The principle that seems to explain it, that lies at the basis of all beautiful impression, is the principle of harmony, which

involves the action of God's universal laws on substances and forces of His creation, to realize in each case some specific purpose of His own. In this consists design, the adaptation of means to an end. In this is comprehended the happy fulfillments of function in living things, whereby Ruskin explained vital beauty.

Fine art is nothing more than the adaptation of things to a given end, the combination of factors individually pleasing into wholes that give supreme mental gratification. Art is harmony, and its ultimate purpose is to bring our souls into harmony with whatever is purest and noblest in nature and man. Beauty is a quality that we cannot in this day afford to overlook in our roads. Let them be constructed with some regard to this universal principle. Make the roadsides attractive. See that they are not disfigured by heaps of brush or made the receptacles of lumber and culch. Plant trees where there is need, and an occasional woodbine, and preserve and trim the comely shrubs nature is mothering. State or town should own and care for a strip ten to twenty rods wide on each side of the highways, preserving the forest trees thereon, and attaching the severest penalties to their defacement by advertisers and birch bark fiends. There is nothing more exasperating to a lover of natural beauty than the sight of queenly birches, those fairies of the wood, as the Red Men called them, girdled with black bands, stripped of their paper bark by ruthless desecrators, who shred it in tatters as they ride along. The beautiful trees have become eye-sores, unesthetic objects, to be removed—or you may try my experiment of painting the blackened rings with a matched color. If the roadsides could become the property of the state, their disfigurement would be a thing of the past, as is the case in Europe. In some countries a land-owner cannot cut a tree without the approval of government foresters, and the right to cut is granted only on condition that a young tree shall be set out in the place of every tree that is felled. In this way are preserved, for the good of the whole community, forests that are instrumental in maintaining

and regulating the water supply, protecting from avalanches, modifying the rain-fall and the force of wind storms, thus giving important protection to cultivated districts and tending to prevent sudden and extreme changes of weather. In this way is preserved the beauty of European roads, some of which are tended as carefully as gardens. We have our Arbor Days. Why not, during the decade to come, devote them to the planting of roadside trees as well as to the re-afforestation of the great portion of this state that is available only for forest cultivation? There is nothing more germane to their interest than that our farmers should be awakened to a sense of the value of properly treated roadsides, to a feeling that beauty there plays a useful role in making their localities attractive to summer visitors. And roadside beauty is far less expensive than roadside ugliness, because nature does most of the work. The farmer need direct his energies only in the line of encouragement and protection. It costs nothing to protect the roadside birds from predatory cats and thoughtless boys. An ounce of shot now and then and an ounce of wholesome instruction are all that is needed, and before the farmer realizes the worth of his policy, people are coming to his woodlands from Boston and New York to hear the ethereal strains of the hermit thrush, and everywhere through his forest aisles, song and white-throated sparrow, blue-headed and red-eyed vireo, bay-winged bunting, warbler, snow-bird, rose-breasted grosbeak, Wilson's thrush and winter wren, make music such as art knows not. One such bird, a squirrel running on the fence, a few trout in his meadow brook, are of more concern to the farmer whose guests are the students of nature than a whole generation of cats.

It costs nothing to care for the roadside wild flowers, from the trillium, anemones, and arbutus tufts of early spring to the white and purple asters that checker the October roadsides. All through June the pink cypripedium, or slipper-shaped orchid, colors our woodland dells. Blue and white violets spangle the meadows. Mauve azalias and white honeysuckles breathe in favored nooks their delicate odors, and every

wall is snowy with blackberry blows, that Walt Whitman said would adorn the parlors of Heaven. Strayed from gardens long forgotten, hoyden Jacqueminots, rich in attar, spread their gaudy magenta in road-traversed pastures; and pale swamp roses lay bare their golden hearts amid wet thickets that creep to the edge of the carriage-way. And then born to joy and pleasure,

> "O'er her tall blades the crested fleur-de-lis,
> Like blue-eyed Pallas, towers erect and free."

As the summer wears on, the clematis climbs in tangles of silvery plumes, and sweet scented nympheas,—"white angels of the crystal lakes," light many a wayside recess. Fireweeds flaunt their brilliance in the clearings; blue gentians dapple the low grounds; the purple sarracenia lifts its grotesque pitchers in the peat bogs; and waxy stems of Indian pipe nod their corpse-white flowers over the roots on which they feed. The open woods are prankt with orange lilies; and orchid beauties, "the elite of the floral kingdom," display their blooming wonders within arm's reach of the highway. At last, in the September days, the world seems turned to golden rod ringing with the cricket's song; and low-voiced streams trickle through glossy pools, where just over the brush fence, cardinal clusters still signal the ruby-throated humming-bird to feast upon the nectar stored in their "heart-red bloom."

It costs nothing to withhold the scythe and spare these beautiful children of nature that are so companionable to the stranger from the city. They have a money value, every one of them, and it costs the land-owner nothing to realize. There are no commissions to pay.

Nor does it cost anything to care for roadside science—to place an interesting specimen on the stone wall or the door rock—an oddly shaped cobble, a piece of mica schist, a bunch of tourmaline prisms, a feldspar or quartz crystal, or a beryl bearing fragment—to open vistas to landslides, ledges, and curious geological formations, or to simple wayside fountains

fringed with bracken. Beauty is so cheap there is no excuse for being without it. Let me ask you then, is it policy, is it expediency, is it economy to abandon our roads to that despoiler of natural charms, the lineman, with his ghastly telephone poles, and that turner of rest and romance into commonplace and nerve exasperation, that worst of all rural vandals—the electric car company? I assure you the electric car is an enemy to every country section that thrives on summer visitors. If these things have to come, let them cut their own paths. Force them by law to avoid our venerable highways, with all their clusters of sweet association. Save the New Hampshire roads from these devastators. Let there be one state in the galaxy that honors the old paths. Hundreds of miles of your beautiful roads are being destroyed by the lineman. His unsightly poles are everywhere conspicuous against the green. Your mountain villages are turned by him into gigantic pincushions. The ground in his wake is covered with the debris of shrubbery and forest trees. Some of your highways have come to resemble settlers' clearings, with their ugly piles of brown brush, their stripped tree-trunks, and gnarled, crooked, peeled poles. Neither taste nor conservatism is anywhere manifest. The contractor is as ruthless as a Spaniard. Now it is a mistake to suppose that selectmen can give to any company the right in New Hampshire to disfigure our doors and dooryards with telegraph and telephone poles. Except for purposes of passage and transportation, roads are in this state essentially private property. The land is given or sold for this use exclusively. The farmer owns the roadside crops and fruit, and gathers them as they mature. The farmer has to keep the fences and the stone walls, and he is certainly justified in protesting against the erection of disfiguring poles in front of his dwelling and the destruction of valuable shade trees for their accommodation. I have seen hundreds of dollars apiece subtracted in a single day from the value of farmhouses for residential purposes by the builders of telephone lines. I mean to say that locations commanding views of exceptional beauty are rendered unsalable to city

people by a string of ugly telephone poles, which not only mar the prospect but introduce an unesthetic element into the scenery, repulsive in its associations to all people from the towns. Let these companies buy the right of way over the fields. Force them out of the most picturesque roads in the world. You have the law on your side. And if you would further protect the roadside groves of New Hampshire discourage the establishment in your vicinity of a pulp mill, which invites the vandalism we are deprecating but employs no labor in return, and fouls every water course in the state.

Despite the prospective advances of electricity and the popularity of the bicycle, I do not believe wagon riding is to be discontinued, and that the horse is to become extinct. I believe that the driving of a fleet, intelligent horse is to be a recreation of the future. No pleasure will ever displace journey by carriage or on horseback over reasonably smooth roads through picturesque scenery. There is something in the harmony between a living horse and a trained human driver or rider, in which both find the supreme pleasure of their existence—a something that neither bicycle nor horseless carriage can give. God might have made a nobler animal than the affectionate, intelligent, high-spirited, tireless Kentucky thoroughbred, but He didn't. There is no force in the argument that roads as we now know them are soon to lose their utility. We need them for the health and entertainment of the 200,000 visitors who make their summer homes with us because of the romance that still clings to these hills, and the survival of old farm life, and the deathlessness of the American character here in New England.

I remember some five years ago ex-Governor Flower of New York made this statement, that the movement for good roads had this advantage over most social reforms—the argument is all on one side. Nobody is opposed to it. The practical question is how shall we get them? First, we must have money. Now, how shall this money be raised? Some favor national roads, laid out and supported by the federal government. It is apparent that this would involve the

usual abuse of the taxing power. Official corruption and jobbery would thrive. The cost of good roads would be inconceivable. The state, perhaps, is a better landlord than the federal government. The necessarily increased taxation, which all fear, instead of falling entirely on the farmers already overburdened, would be distributed among the residents of the towns and cities, who enjoy the roads, and who are under obligation to contribute toward their maintenance. Besides, it is, I believe, a political axiom that the larger the area of taxation the easier it is to secure an appropriation for public improvement; hence, state or county roads would seem preferable to town roads, which afford opportunity for the payment of taxes in days' labor, and involve the application of local option principles to a dangerous extreme. I dare not go so far as to proclaim it the duty, but I most unhesitatingly assert it to be the wisdom of the state to provide by legislative act for the improvement of our by-ways and highways.

The second essential to good roads, the expense being provided for, is the availability of properly qualified road builders, persons specially educated to construct and prepare the roads on scientific principles. Courses in road engineering are now offered in a number of our universities, notably Brown, Lowell Institute, Vanderbilt University at Nashville, and the Lawrence Scientific School at Harvard. The same educational advantages are now at the disposal of would-be road masters as of other educating engineers. This is a practical age. A demand exists for graduates from such departments, for few civil engineers know anything of road-building science. When the Agricultural College of New Hampshire adds to its many useful departments one devoted to road engineering, we may hope to see in this state as good roads as are to be found in the civilized world.

In the absence of Gen. Roy Stone, who had early engaged to be in attendance and was announced on the printed program as one of the speakers of the evening, but who had been

ordered elsewhere by the government, as mentioned by Mayor Eames in his remarks at the opening of the institute, and was, therefore, obliged to cancel his engagement, the president introduced to speak in his place his assistant in the work of the Good Roads Inquiry Bureau at Washington, Gen. E. G. Harrison, who, for the short time remaining, proceeded to discuss, in a plain, matter of fact manner, the "Relation of the General and State Government to Highways."

GENERAL HARRISON'S REMARKS.

In opening he expressed his embarrassment in being thus called upon to stand in the place of another whom the audience had expected to hear, and explained how it was that General Stone had been ordered to report to General Miles for service in organizing a road building force to accompany the army in the invasion of Cuba. The paramount importance of good roads in facilitating the progress of an army was recognized by the federal government, and was the first thing to be considered in preparing for the contemplated invasion. In his connection with the commissary department of the Union army in the war of the Rebellion, General Harrison said he had seen the movements of the army delayed for days while the supply wagons were stuck in the mud in the miserable Virginia roads, and all progress rendered impossible. Such contingencies were to be guarded against, as far as practicable, in the war now being entered upon.

Proceeding with his subject, the speaker said it might perhaps be wondered why it was, or how it should happen, that the general government should take up this matter of highway improvement in any way. The subject had been discussed by the people and by various organizations for many years, and a strong interest had been developed in various quarters. Finally the New York Chamber of Commerce, which had given a great deal of consideration to the matter, sent a memorial to Congress, asking that the subject be taken cognizance of by that body. Congress took it up after a time, in a humble way, and instituted a bureau of inquiry to make

investigation throughout the country, and ascertain if possible whether or not the country was really suffering from bad roads to the extent which had been represented.

By patient inquiry in all parts of the country, and by practical experiments conducted under every variety of conditions, certain important facts were definitely arrived at, which the speaker displayed most effectively by means of a chart. First, it was shown that the average haul of the American farmer in getting his produce to market or to the nearest railway shipping station is twelve miles. The average cost per ton for hauling, over the common country roads, is twenty-five cents, or a fraction over, which makes the average cost per ton, for the average twelve-mile haul, three dollars. Careful estimate places the total number of tons of produce hauled at 300,000,000 per year, which makes the total cost of hauling amount to the vast sum of $900,000,000. Careful investigation and experiment likewise demonstrated the fact that the average cost per ton, per mile, for hauling over the improved hard roads, which had been constructed in different sections, was only eight cents per mile, which would make a saving of more than two thirds, or over $600,000,000 per annum, in the total cost of hauling all the produce of the country, could it all be done over these improved roads—an amount exceeding the entire annual expense of running the general government and all the state governments combined. Thus it has been clearly shown through the work of this inquiry department, or bureau, maintained by the general government, what a vast field for saving the people of the country have before them in this matter of the construction of improved roads. Given good roads everywhere and this annual saving of six hundred millions of dollars will be made annually in the transportation of the farm products of the country alone. A good road, according to the accepted definition of the term, is one that is smooth, hard, and fit for service at all seasons of the year.

The annual appropriation made by the government for the collection and publication of these important facts is but

the small sum of $10,000. In addition to this work there has come a public demand for speakers upon the subject of good roads, which has been met as extensively as has been possible under the circumstances. Last year another line of work was taken up by the bureau, which was the building of sample sections, or specimens of good roads, as models, at several different agricultural experiment stations in the country, including those at New Brunswick, N. J., Cornell University, Warren, Pa., and Kingston, R. I.

Concerning the relation of the state government to the highways, the speaker said it varied, practically, with the different states, though the duty of the several states in the premises was necessarily identical. In New England the local idea generally prevails, every town or municipality looking out exclusively for that portion of the highways within its limits, although the roads are open to and practically the property of the entire people. Very little progress can be made until a broader idea is adopted, just as has already been done in many of the states in relation to the care of the poor, and in some in the support of the schools; the state of Pennsylvania, for instance, appropriating $5,000,000 per annum to supplement the work of the municipalities in school maintenance. If good roads are to be had, they must come through the direct action of the state itself. The roads belong to the state. The people in the cities make use of the highways in the country towns as freely as do their own inhabitants, though they contribute nothing toward their construction and maintenance. It is but just that they should be made to do so.

The system of state aid in the construction of highways was first adopted in the state of New Jersey. In some of the northern counties of the state the construction of permanent roads had already been carried on to a considerable extent, and the improvement was so noticeable that many wealthy residents of the adjoining sections of New York sold out and removed there, so as to get the benefit of these improved highways. The purely agricultural counties of

the state, however, could not venture safely upon the measure of expense involved in such work. But the board of agriculture took the matter up, made a thorough investigation, found the county system preferable to the town system, and commenced an agitation in favor of the principle of state aid, with such effect that in 1891 the present law was enacted, under whose terms when counties construct sections of highway which is up to the approved standard, they shall be reimbursed by the state to the extent of one third of the total cost of construction. It was hard at first to get the counties started in the work, but of late they have been "tumbling over each other," as the expression is, to avail themselves of the benefit of the act, so that now eighteen of the twenty-two counties of the state are at work under the system, through whose operation every $100,000 appropriated by the state insures the expenditure of $300,000 in the construction of permanent improved highway. In Connecticut a similar law is in operation, while in Massachusetts, where much has been done in the past few years, the state pays three fourths of the expense and the county one fourth. In Pennsylvania, at the present time, the state is expending in this way about $4,000,000 annually for highway improvement. Under the operation of this system in New Jersey, where it has been longest in vogue, although taxation was increased at first, it is now actually lower than before it was adopted, on account of the less expense required for keeping the highways in repair. For this reason, therefore, as well as on account of the vast saving in cost of transportation over the improved roads, which can only be secured in this way, and the resulting general comfort and convenience, the Road Inquiry Bureau of the government heartily approves the system of state aid, which it also believes to be based upon the principles of justice and equality.

In concluding, General Harrison said he had been a practical road builder for more than thirty years, and tomorrow he expected to have something to say upon the subject of road construction.

WEDNESDAY, MAY 18.

According to the original plan, the forenoon of Wednesday, the second day of the institute, was to be devoted to witnessing the practical operation of various kinds of road working machinery, but some unavoidable delays in the matter of transportation put a portion of this part of the program over until after dinner. Many of those in attendance, however, improved the time in a pretty thorough inspection of the Keene system of street construction and repair, under the pilotage of Mayor Eames and Superintendent Nims, while the very effective work of an improved road machine in operation on the upper section of Washington street was observed with interest by a large number. After dinner the working of a portable stone crusher and elevator, sent for exhibition, which had been set up on Court street, and was operated by an eight-horse steam engine, commanded the attention of all. An adjustable distributing cart, designed for the ready and proper distribution of the crushed stone upon the street, preparatory to the work of the steam roller, also attracted close attention; while not a few were interested in the work of an improved street cleaner or scraper, invented and manufactured in Keene, which was pronounced by General Harrison and other experts present the best affair of the kind yet found for cleaning macadam roads.

The Wednesday afternoon session of the institute opened at a quarter past two o'clock, when, after the usual opening song by the choir, General Harrison was introduced to discuss the subject of

ROAD CONSTRUCTION.

In the outset he repeated for the benefit of those present, who did not hear him the previous evening, the presentation of facts, illustrated by chart, as to the comparative cost of transporting the annual farm products of the country to market over the ordinary highway and over the improved hard

road, showing how an annual saving of $600,000,000 might be made. He then explained, by reference to a diagram, the difference between the various kinds of roads, including the railway and stone, gravel, earth, and mud roads, and the comparative cost of hauling a ten-ton load—the average car load—over the same. It requires five times the power to draw a given load over a stone road, which is the best form of highway constructed, that it does to draw it over steel rails; ten times as much over a gravel road, and twenty times over the common earth road.

Going on to discuss the matter of construction, he said the important thing was to begin right. A good foundation is absolutely necessary to a good road. Water is the enemy of the road, and means must be taken to get rid of the water at the outset. There is no better road than a clay road, if the same could only be kept dry; but when wet it is almost impassable. In the work of construction, if it appears that there are springs anywhere that are likely to send the water into the road, guard against the same by ditches. If the road is to go through wet, swampy land, put in drains at the outset that will carry the water away. In deep bogs piling or filling must be resorted to, to give the necessary foundation. Give the sub-grade or foundation the same shape or form that the finished road is to have, sloping it in the right way so as to carry off the water, and be sure at all times that the way is clear for the water to run away, by keeping the ditches constantly unobstructed. Water, though the enemy of the road, is not so bad an enemy as it might be. It will run away if you allow it the opportunity.

Having got in the sub-grade or foundation begin the use of the roller. That is the most important implement in road construction. You must have that if nothing else. Get out all the sods and stones, and then roll thoroughly, making it hard and compact and thoroughly uniform in surface. It is then ready for the stone, which should be put on to the depth of eight inches, putting in a layer of the larger ones first, with smaller ones on top. Roll these down compactly

and then put on a layer of finer stone for the surface. The last should be as uniform as possible, and as near cubical in shape—not over an inch and a half in extent. This surfacing stone should also be the hardest and toughest obtainable, and should be rolled down thoroughly, the same as the foundation. Then a layer of ground stone should be added, and this sprinkled and also thoroughly rolled. While a steam roller is not absolutely necessary, it will be found most economical for cities to have the same. The speaker put much stress upon the importance of looking out for a strong foundation in building roads, since with improved roads and improved carriages for transportation far heavier loads than ever before will be carried, which, indeed, is one of the great objects sought.

So far as the proper maintenance of the road after construction is concerned, the great essential is constant care and attention. The ever watchful eye must be upon it, precisely the same as in the care of our railroads. The slightest defect which appears must be remedied at once. By pursuing this system the roads will be constantly kept in order. Keep one man all the while on the lookout, to guard against all defects, and especially to keep the water out of the road at all points in the early spring. By constant care in this direction, even our common roads can be vastly improved in the course of a few years.

In closing, the speaker expressed his satisfaction that great improvement in the highways is being made in all parts of the country, and the interest in good roads is everywhere on the increase.

ADDRESS OF HON. ISAAC B. POTTER.

The second and last speaker of the afternoon was Hon. Isaac B. Potter, of New York, president of the League of American Wheelmen, who spoke in part as follows:

The matter of improving roads is purely one of business. What business man or corporation would tolerate such roads

as we have in many places in the country in their private grounds? When you send men to the legislature, they should investigate and be leaders in all matters of public improvement. Just as sure as the farm goes to decay, so does the country. Your farms are not of the best. Many farmers have gone West, but in thirty counties in Illinois, strictly agricultural communities, the population is decreasing and also the value of farms. The city and town properties have increased at the expense of the country. In riding through France one can see farms made rich by the industries of the people and good roads. There agriculture is taught in the public schools, and an Englishman has said that if the same methods were adopted in England, it would save the country millions of pounds sterling every year.

There are no fences in France. They do not see the need of them. The circumstances are not the same here, but too much is spent here by the farmers on fences. There are magnificent roads everywhere in France, enabling farmers to haul large loads of produce easily. One man was met with a load of five tons of hay driving nine miles beyond his first market to get what the hay was worth. In our own country when a farmer goes to market the buyer makes the price, because the farmer can go nowhere else on account of the poor roads. The farmers pay millions for horses and machinery, but scarcely anything for roads. Wherever good roads have been built, the farmers are enthusiastic in their praise.

The first appropriation by the New York legislature for good roads was $400,000. Before the bill was passed two hundred farmers appeared before the committee to protest against the appropriation. At a recent session, these same farmers appeared before the committee in favor of an appropriation for roads, and when asked to write the amount needed on slips of paper, the smallest was $1,000,000. When they have good roads, the farmers are not at the mercy of the middlemen. They are more independent. It has been demonstrated that good roads are the salvation of the farmers.

When James G. Blaine was secretary of state, he instructed all of the foreign ministers to report the benefits derived from good roads in the countries to which they were accredited, and their reports were of great benefit to our people. The railroads find good roads so profitable in New York that they cause literature on the subject to be printed and circulated.

New Hampshire wants some one to go through her counties every year to get the farmers together and instruct them in road making, using improved machinery and showing them its benefit. If a tax of $20,000 a year, of 20 cents on a $3,000 farm, was collected for this purpose, every farm would soon be more valuable. When the farmers get together and demand good roads, we shall have them. I hope when your legislature meets in January, a bill will be put in to appropriate at least $20,000 for road improvements and for the appointment of a competent road commissioner, to go into every county with improved machinery, and give lessons in scientific road building. Such a movement will give such practical results that it will never stop. The wheelmen will help in this work. They only need a narrow track, but they have spent money enough on good roads in five years to build bicycle tracks all over this country. They are not selfish, but want roads that are good for others as well as for themselves.

Closing Banquet.

The close of the institute was pleasantly signalized by a banquet at the Cheshire House, Wednesday evening, plates being laid for about one hundred persons. After the viands provided for the delectation of the inner man were disposed of, Hon. Francis C. Faulkner, who had been designated as master of ceremonies, rapped to order, and, after a few pleasant words of greeting, in which he expressed the obligations of the citizens of Keene to the Board of Agriculture and the institute speakers for the pleasure and profit which the sessions had afforded, called out successively the following named gentlemen, who responded in well chosen words, frequently

embellished with the flowers of sentiment and humor, to the toasts or topics indicated:

Mayor George H. Eames—Good streets and sidewalks, an important factor in the attractiveness of our New Hampshire cities and towns.

Hon. Joseph B. Walker, president of the State Board of Agriculture—The interest of the state in good roads.

Hon. J. O. Sanford of the Vermont Board of Agriculture —General subject of good roads.

Hon. George A. Marden of Lowell, Mass.—The good roads which lead to success.

Prof. J. D. Quackenbos of New York—Roadside trout ponds, with special reference to the Dublin trout.

Albert Jenkins of Milford—Good roads of the town of Milford. In reply to some remarks of Mr. Marden.

Hon. Isaac B. Potter of New York—The wheelman's interest in good roads.

The speaking, which was generally of a high order, gave universal satisfaction, and was closely followed by all. Among those in attendance at the banquet were Secretary Bachelder and Messrs. Bill and Hadley of the Board of Agriculture, Secretary E. C. Hutchinson of the State Grange, Mayor A. B. Woodworth, J. H. Rowell and Street Commissioner Clark of Concord, ex-Mayor Batchelder, Clark F. Rowell, and many other representative citizens of Keene.

While the attendance during the sessions of the institute was not as large as might have been desired, it was made up in the main of the men most likely to derive the greatest measure of benefit—those practically interested in road construction in the various communities in that section of the state, and it is not too much to hope that widely beneficial results will follow.

The cordial co-operation of the mayor and city government of Keene was fully appreciated by those having the institute in charge, and at the close of Wednesday afternoon's session the hearty thanks of the meeting were unanimously voted to Cheshire Grange choir for the excellent music furnished throughout.

GRANITE STATE DAIRYMEN'S ASSOCIATION

Hon. N. J. Bachelder, Secretary State Board of Agriculture, Concord, N. H.:

I have the honor to submit to you for publication in the Agricultural Report for 1897-98 the report of the transactions of the Granite State Dairymen's Association for those years.

J. L. GERRISH,
Secretary.

GRANITE STATE DAIRYMEN'S ASSOCIATION.

OFFICERS, 1897.

J. M. Connor, President, Hopkinton; C. H. Waterhouse, Vice-President, Cornish; G. H. Wadleigh, Vice-President, Tilton; J. L. Gerrish, Secretary, Webster; N. J. Bachelder, Treasurer, Andover.

TRUSTEES.

Herman Noyes, Rockingham County, Atkinson; A. B. Locke, Strafford County, Barrington; J. W. Sanborn, Belknap County, Gilmanton; Alonzo Towle, Carroll County, Freedom; Geo. M. Putnam, Merrimack County, Hopkinton; D. G. Roberts, Hillsborough County, Goffstown; Willard Bill, Jr., Cheshire County, Westmoreland; G. W. Stanley, Sullivan County, Langdon; W. D. Baker, Grafton County, Quincy; Albert Corbett, Coos County, Colebrook.

ANNUAL MEETING, WOLFEBOROUGH, DEC. 10, 1896.

ANNUAL ADDRESS.

PRESIDENT J. M. CONNOR.

Fellow Dairymen, Ladies and Gentlemen:

In presenting a few thoughts at the opening session of the Granite State Dairymen's Association, I am sure you will not expect me to offer anything original or in striking contrast with what has heretofore been said or written. If, indeed, I will be able to present a few well known truths and seemingly threadbare expressions, in a manner that will carry conviction to the large class who as yet fail to put to practice what they ought to know at this advanced stage of dairy progress I shall have accomplished some good.

At this period of agricultural depression, those who make dairying or milk production a specialty may console themselves that they have the best of it, that their chances in the future are brighter than those promised to other departments of agricultural work; yet the margin is very close, and it is only by the practice of rigid economy and the adoption of the best known dairy methods that the average dairyman can meet all his obligations and keep his farm from depreciating.

From the report just issued from the State Board of Agriculture, we gather facts which tend to show the general drift of agriculture in this state. The decrease in the number of farm animals since 1894 has been as follows: Horses, 3,336; oxen, 4,024; cows, 7,086; other cattle, 27,080; sheep, 44,171; total, 85,833,—a decrease in valuation of $1,653,555. Of course, due allowance must be made for the law which exempts from taxation all cattle under three years of age. This would not change the result in the number of horses, oxen, and sheep, but of cows somewhat, and of what

is classed as other stock very materially. But these tables show unmistakably the drift of things. Notwithstanding the great decrease in stock, there is an evident increase yearly in the purchasing of grain and hay to support this diminished number. The enormous consumption of western grain and the constantly increasing consumption of baled hay by farmers assert the fact that our farms are constantly and surely decreasing in food production for farm animals.

How can this be arrested is a question of vital importance to the dairyman. This going to the creamery or the railroad station with the milk and loading back with grain is a process that ought in a measure to be discontinued.

The wail goes up: "If it were not for the grain bill I could realize something from my cows." One thing is sure, that with the present amount of help on our farms no great amount of progress can be expected along the line of increased production. The help is entirely inadequate to the undertaking. When one man or even two men undertake to carry on a hundred-acre farm, more or less, no permanent improvement need be expected. The field is ripe for improvement, but the laborers are few. Most farmers will argue that in the event they can hire reliable help, that at present prices they could not make it pay. There is some reason to this from the fact that the price demanded is disproportionate to the cost of living.

I have hired help on the farm almost constantly for upwards of thirty years, and I find the cost of farm help as much today as it was during the civil war, and for years thereafter, while the cost of living was double what it is today. Men seem determined to be idle unless they can obtain about such wages, and the farmer is equally determined that his farm shall lie idle also rather than pay such prices.

When the remark went forth from some one that the best fertilizer we could use on our farms was brains, it was thought by many to be a smart saying, but I regard it about as absurd as to recommend the use of muscle as a fertilizer. The solution of the problem is the use of brain and muscle.

Alas! this teaching leads altogether too large a class of our people to imagine that they can get a living by their wits, while their muscles are idle.

Let us look this great subject squarely in the face. We talk about the dignity of labor! Who believes it? Not the ruling classes; not the professionals; not even our agricultural colleges, which ought to combine manual labor with mental training. Not a paper we read but we find whole columns devoted to athletic sports in all our institutions of learning. Young Men's Christian Associations gather in the young men, not to teach them the dignity of labor, but how to acquire fame as baseball players.

Costly buildings are erected and furnished that the student may have training in physical exercise, but it would be undignified to give the student a few lessons in sawing a cord of wood, when he could get the exercise and be of more benefit in the world. But some will say, what has this to do with dairying? We remark that the tendencies show unmistakably the abhorrence of honest toil; they show a constant drifting away from the farm, the concentration of population, the increase of crime and poverty in the great centers of our country.

Agriculture, when dignified and made honorable and profitable, is the foundation of national greatness. The future of agriculture in this country is a problem of far-reaching importance. Three fourths of our exports are products of the soil. These exports determine the prices of all the agricultural commodities. The same influences that developed so rapidly the agriculture of this country are now at work in the hitherto unproductive portions of the globe. We may reap a temporary harvest from the famine in India, but the railroads, which are now penetrating that country with a population four times that of these United States, will soon make India a charming rival of ours in the European market. Australia and the Argentine Republic are rapidly developing their agricultural resources, much to our discomfort.

When the civilizing power of steam and electricity is brought to bear in these countries, we shall see a different condition of things than we have seen for the past fifty years. The dairy industry may console itself that it has an advantage over other branches of agriculture in this great race for supremacy in the English markets. Grain, beef, wool, and hides will flow into the channel of commerce from these countries, but not dairy products.

In considering the tendency of agricultural teaching, I desire to call attention to its bearing upon prices and how we should strive to equalize the relations between the producer and the consumer. Strange it is that the agricultural press, experiment stations, all combine to see just how low the tiller of the soil can produce a given article. It was but a few years ago, when the creameries were paying their patrons twenty to twenty-eight cents per pound yearly for their butter, that the startling news was heralded through the press that in an adjoining state an experiment station had actually demonstrated that butter could be produced for twelve and one half cents per pound. The dairyman soon found himself there. We shall next expect some expert who enjoys a good experiment station salary, to tell us that butter can be produced at ten cents per pound, providing the good farmer practices a little more self-denial and stops one more leak some scrutinizing eye may have discovered. This is all very well. Economy, diligence in business, a thorough knowledge of whatever we attempt to do is good agricultural gospel.

But after years of experimenting and discussion along these lines of cheaper production, has it never occurred to us that the agriculturists are the only class who are constantly trying to cheapen the labors of their own hands and brains? Did you ever know of an instance where the medical profession at their conventions discussed the importance and the possibilities of cheaper service along their line of practice? Did you ever know an instance where the members of the legal profession at their gatherings seriously discussed how to serve their clients at less cost by more rigid economy and by

weeding out practices that tend to increase the cost of their services? Did you ever know of an instance where those aspiring for offices of trust, whether state or national, or in any position where a good salary is at stake, pleaded their claims on the grounds that by close economy and the stoppage of many leaks caused by extravagant living, they could fill those places of trust at a greatly reduced compensation? But no! every class and profession, every legislative enactment, have for the last twenty-five years combined to increase salaries; combined all along to nearly double the cost of their services.

In presenting these thoughts I draw no imaginary pictures. They are facts that no person can gainsay. If low prices are to rule in the future, which seems almost inevitable, the dairyman, the farming class as a whole, must consider well the tendencies, and either demand better compensation for their labors or that others, by the practice of economy and diligence in business, shall be compelled to labor for a less compensation. The same cause that ruined the agriculture of New England, and some other states bordering on the West, is now at work to lower the profits of agriculture throughout this whole broad country. It is no less than the introduction of railroads and improved agricultural machinery into all parts of the inhabitable globe. What brought the products of the great West to the very doors of our New England markets will also fill the markets of the Old World with the products of the hitherto vast productive regions.

But whatever speculation we may indulge in regarding the future markets for our great surplus agricultural products, which exert such a marked influence upon the financial prosperity of this country, we, as dairymen, have the least cause for alarm. If there is hope anywhere, it lies in the direction of our work. There is no work upon the farm which brings into active use so many of the intelligent forces of our nature as dairy work. The great change that has been wrought in the dairy industry in this state in the past fifteen years attests the fact that our farmers have made great progress in their

powers of discernment in their methods of work. While we have elevated and improved the farm animal, brought her product to a level with the best in the country, we should not forget what it has done for our farming population. If we desire to progress to a higher and nobler manhood and womanhood, it matters very materially to what we devote our time.

There is no department of labor, numerous as they are, that will do so much to expand the mind and elevate the tastes as that required in the breeding, feeding, and all the processes required to the last finish as we see in the grand display of dairy products in yonder building. Therefore, if the labor of our hands has not brought us a large remuneration, we have the satisfaction of knowing that our labor is not of a menial kind, but rather of the progressive, upward and onward type, which brings satisfaction to man if not to his purse.

DAIRYING.

PROF. C. H. WATERHOUSE, DURHAM.

There are so many things to be said about dairying, one is at a loss as to what facts will be the most profitable in the few minutes' talk I may give you. Earnest, practical men, I assume, are better pleased with that which is useful and applicable to their business, although stated in the plain language I may use, than with speculative theories. I come to you from the best dairy region in New England. The oldest dairyman went from New England to Hermiker county, New York, one hundred and ten years ago, on foot, with an ax upon his shoulder and eight shillings in his pocket. He felled trees in the dense forest, built his log house, and established a herd. Taking to himself a Cheshire girl for a wife, they made a dairy in New York. This man's name was Arnold. He accumulated a large wealth and went to his rest honored. From this beginning sprung the mighty giant that is now walking over the continent. American dairying

now represents annually more than three hundred and sixty-five million dollars for butter. From these figures it will be seen that dairy farming is a most important branch of agriculture.

The idea of associated dairying originated in Europe and grew out of necessity; it was the offspring of poverty rather than wealth. People would turn in from one to ten cows and employ a man to take them to the mountain regions; there the herdsman would care for the cows and return to each his proportion of cheese. What distinguishes the American system is the constant effort to reduce the art to a science—the buildings, appliances, and manipulations in the various departments. Looking back over the past, I can but think we are on the threshold of agriculture, and that God wills that science and intelligence are the main forces to open up to us the resources of nature. It is a most hopeful sign of progress that farmers everywhere are organizing societies for the purpose of obtaining useful knowledge in their specialties, and operating together for their interests.

In the remarks I have to offer, I hope to point out briefly some of the important requirements for success in dairy management.

The process of cutting and curing fodder is well understood by almost every farmer. The kinds of food to be fed each day to make a balanced ration is not well enough understood. Silo has come to stay, and experience has taught, and is still teaching, us how to preserve silage. Fifty cents a ton to secure it is a possibility. Dairymen study to know how to balance the rations.

Have good, well ventilated stables, pure water, plenty of light, some say, continuous confinement. I am undecided. Milk regularly and cleanly. Always clean the cows. Aerate the milk in pure air. Cool to a temperature of 60 degrees, and hold there until arriving at the creamery. Do not haul hogs, calves, or sheep at the same time you do milk, neither use a manure or dead axle wagon, nor allow the driver to smoke all the way to the creamery and blow smoke or his

perfumed breath over the milk when he empties it into the weighing can. I should prefer a little fertilizer to an abundance of tobacco smoke. The separator will take out the fertilizer. Cooley cans will not do this. Keep out the flies, and know that the cans are clean.

Now the milk is supposed to be in my possession. I denounce a too common custom of forcing milk up into vats by steam jets, or heating milk in tanks by the same means. Supply a device that will heat the milk as fast as it runs into the separator by means of pipes lying in hot water. I would separate at as low a temperature as separators could do perfect work. I would have the best means of cooling cream to the proper temperature.

How often you read from one who wants to tell how to make good butter. "You must have your cows clean, give them good clean food, set your milk at a proper temperature, work it sufficiently, etc." No one can take such a description and make a good piece of butter. I say cool your cream to 58 degrees six months in the year, 60 degrees three months, and possibly 62 to 64 degrees the other three months. Always keep the temperature of the cream room lower than the temperature of the cream; by so doing the impurities will be thrown out. Churn at a temperature that requires forty to sixty minutes to churn. The buttermaker must use his judgment. I have not in eight years warmed cream for churning. I do have to cool it a little before starting the churn. If I had cream for nine hundred pounds of butter I should know, by experience, just how much ice it would take to cool the cream two or three degrees. I would have the ice pulverized and in pails. If my churn had two covers I would have one on; then start the engine and as quickly as possible dash in the ice, on with the cover, and start the churn. Why? There is not a good buttermaker that will tell you cream can be churned at a temperature of 35 degrees, consequently the ice having cooled the cream by long standing would not churn so exhaustively.

Proprietors of creameries should provide means for controlling the temperature of cream rooms. I would not use a tank for ripening cream in which the cooling and heating must be done by ice water and hot water around the cream. The cooling is not uniform and is too slow. Ripening would be going on for a time at a high temperature, and the part near the tank would be ripening at a very low temperature. Suppose you wished to heat the cream by means of steam jets into the water around it. The water must be heated in some parts much too hot, which will coagulate the milk in the cream and cause specks in butter. I have on exhibition four pounds of butter made from the same tank of cream. This is to convince you that manipulation has something to do with such things.

I have suggested that states have a man appointed by the governor, and paid a salary of perhaps $1,000 and expenses, to make a town-to-town canvass and put all creamery men on the right track, pull in all violations of the oleo. law, etc. This means to improve the quality of goods and increase quantity sold.

A CREAMERY MANAGER.

It has long been a study among creamery proprietors how to get the right man to run the business, and manage the patrons as well. It is gratifying when such an one has been secured, —one who can guarantee his goods to be of even quality; one who is firm and can convince patrons that he is dealing out justice in every particular; one who can prove to patrons that he can tell when there is funny business in the air. Farmers are like all other men, disposed to do as little work as possible. They soon think that they will get just as much for milk handled in a slovenly way, with a large amount of cream taken out for coffee and other culinary purposes, as if they furnished the highest grade of milk. The buttermaker that does not see that the separator is properly handled, milk run through at the right temperature, in fact, know that it does perfect work, leaving no trace of fat in the

skimmed milk, is doing the patrons, as well as himself, an injustice. Did you ever stop to figure what two tenths of one per cent of fat left in a day's milk of 15,000 pounds will amount to? Thirty pounds of butter, worth $7.50. The buttermaker who does not see that the cream is daily ripened to just the right acidity is doing all parties an injury. Are you, brother buttermakers, up to date in all the small details of the work? Do you always keep your dish cloths clean? The buttermaker that will favor a director or any officer is not worthy of the position. Too much of this is in some cases done. There is only one way, "Hew to the line."

You remember I mentioned aerating milk in pure air. Not long ago I went to a man's barn for the purpose of buying some cows. I discovered milk cans sitting in the stable behind the cows, an old door placed against the cans to keep the manure, etc., from spattering them. Such management is not quite up to date, especially in a creamery director. This man would not drink a glass of water at a temperature of 35 degrees Fahr. that had been sitting in the same place two hours. In this case the milk went to the creamery every other day, therefore it remained there thirty-six hours. I will admit that milk as drawn from the cow at a temperature of 95 degrees would for a time resist impurities. Wherein lies the injury? The covers to the cans are supposed to be opened to allow the animal heat to escape. Impure germs find lodgment upon dust floating in the air, and finally settle into the milk. Butter made from impure milk would pass for a day or two, but soon go off in flavor, and the keeping qualities would be injured.

Truly, we are not over anxious about the keeping qualities of butter, as were commission men before the introduction of creameries and winter dairying. Consumers have become aware of the fact that butter two weeks old is not so aromatic as freshly made goods. Here are two bottles of milk drawn from the same cow, one treated as I have told you was not the proper way to do, the other as I recommended. All this to show you the difference. I wish every one interested would taste and smell. (It was then passed around.)

It is said by some that claim to know, that five per cent milk will give a larger per cent gain, by churn, over the test than three or four per cent milk. It is undoubtedly true that some creamery managers have more surplus butter than others.

One man puts up twenty per cent water butter, another thirteen per cent water. I know one man who told me he worked twenty-six per cent water into his butter; to do this he would puncture holes in the butter while on the worker, put in salt brine, then tub it.

The surplus butter item is all right to a certain extent. It is hard to find a butter less than ten per cent water.

The testing of milk is a matter that greatly agitates the farmer's mind, and does not always prove a soothing balm to the creamery manager, especially when tests run low, and he is often blamed for things he cannot control. He must, however, have some skill and much carefulness to do the work justice. I have given time and thought to this branch of the work, and every month seems to bring new developments.

There are some things, I am convinced, will affect the test. Spoons and skimmers have been known to reduce the test very perceptibly. Undue excitement and fatigue of cow will affect it, also churning of milk in transportation from the farm to creamery. I do not think the temperature of milk when sampled does affect it seriously.

Speaking about milk containing more butter fat as a cow widens the period of gestation. Patrons frequently ask me, "Why does not my milk test better, I have four farrow cows?" supposing, I presume, that the rule holds good. A farrow cow's milk does not increase in per cent of fat until she becomes pregnant. To determine what your cow is worth for butter, you must milk her, after calving, about five months, then milk all the milk at one milking into a pail, sample and test; do this for six days, then average the six tests.

We have no authority, as yet, to prove that you can feed into the cow any increase in per cent of fat beyond her capability to produce, but we are convinced that we can reduce

the herd's test by feeding succulent foods. The last test I made on this line was in November. This patron's test for October was 4.55 per cent. November 10, he brought me 188 pounds of milk from ten cows—every other day. The next trip brought 257 pounds of milk.—Test, 3.40 per cent.

The next day, 240 pounds of milk.—Test, 3.70 per cent.

"	"	252	"	"	"	4.10	"	"
"	"	230	"	"	"	4.20	"	"
"	"	218	"	"	"	4.30	"	"
"	"	200	"	"	"	4.40	"	"

These cows were turned into a field of green oats eight inches high. The oats shed before harvesting, and grew, making a very succulent food. I have made other tests of succulent foods, like sweet corn stalks, with similar results. Cows are indeed mysterious! They will vary the percentage of fat from day to day without giving us a chance to find out the reason why. Prof. Haecker found a variation up and down in one week from 2.6 to 4.1 per cent in the same cow. But each cow has her individual average, so testing once a week, and even every other week, has been proved to give a good enough practical result.

COMPETITION FOR THE HIGHEST MARKET PRICE.

J. HARVEY WHITE, BOSTON.

There is a belief, a fallacy, held by most men that in the battle of prices the victory is for him who most deserves success. This, like the theory that all men are born equal, while true in the main, serves but to make conspicuous the fact that there is a charmed circle in which none may enter save him whose aristocratic precedents give an inherited right. There is a class of butter, that I will call the aristocracy of the butter supply, which is exempt from market competition, which sells far above the market price, and for no other reason than that it is what it is, that it bears a particular name, and that is never sold to any except a certain class of

wealthy purchasers, whose high-toned ignorance causes them to believe that when the best butter produced is selling for twenty-five cents per pound, they secure an article three times better by paying seventy-five cents. This class of butter is practically non-competitive, does not affect and is not affected by market values, is sold only at retail, and the price secured is for a long established reputation among a class of people whose patronage can be securely held only by permitting them to pay more than ordinary mortals could afford. It is not with this class that our present discussion deals, but rather that one representing an equal, if not greater, degree of genuine merit, in which the fierce hand-to-hand combat of competition holds its fullest sway, where prizes are won only because they are deserved, and where each contestant finds a place that is a true measure of his ability to succeed.

Successful competition rests upon two foundation stones, namely, economy of production and quality of product. The former has no effect upon market price except as it permits or restricts competition in underselling. As this is the absolute reverse of the subject in hand, it will be passed with a mere mention. The problem which we are to study is "Competition for the Highest Market Price." This is the competition of merit against merit, brains against brains, and advance is its watchword. Success in this struggle rests upon quality chiefly, supplemented by reputation, and is more or less influenced by the sufficiency and regularity of the supply and, in some cases, by self-competition.

First and foremost to be considered is the merit of the article produced, which we will classify under the general heads given on the score cards, and discuss the market demands upon the items of flavor, grain, color, salt, and general appearance.

It is no part of my purpose to attempt to instruct the buttermakers of New Hampshire upon the process of manufacturing butter, an art in which they have already achieved the highest point of perfection yet attained. It is simply from the standpoint of the marketman that I can speak and

mention some of the points in which creamery-men and dairymen most often fail in their efforts to reach the standard of highest attainment.

It need hardly be stated that in butter the importance of flavor exceeds that of all other qualities combined. It is not my province nor within my power to tell you all that is necessary to produce the most tempting flavor. That instruction can be gained only from the practical buttermaker. As a critic is able to point out defects which he has neither the skill nor power to remedy, so shall I under this topic attempt to do no more than point out the more common defects in flavor.

To begin at the logical starting point, we will first deal with the cow. The condition of the cow may cause a commercial difference of a cent per pound in the flavor of her butter, that being made when she is fresh in milk being far superior to that produced from cows old in milk. Feeding is of great importance, as butter is frequently rejected on account of a taste of musty or frosty feed, or as a result of too liberal use of ensilage or cottonseed. Odors in the atmosphere inhaled by the cow are frequently discovered to have become characteristic flavors of the butter.

During the process of milking, as has been so frequently pointed out by every speaker and writer who has ever discussed the subject of dairying, the greatest of care should be exercised lest dirt or filth should fall into the milk, and in this connection may it not be mentioned that cows are as easy to curry as horses? The most fertile source of offensive flavors that cause the salesman to grow gray and the buyer to use unmentionable language is the carelessness of many farmers in allowing the milk to stand in the barn and absorb the surrounding odors until every cow has been milked and the other chores are finished. Deliver us from those who are so painstaking in keeping out dirt, and so careless in keeping out odors, be they from the barn or dairy room, which too often is separated from the kitchen only by a door, which is frequently hospitably open to welcome the savory odors of cooking pork,

cabbage, doughnuts, and other perfumes, which, excellent as they may be, do not add to the commercial value of the butter. Other serious injuries to the flavor of the butter may be caused by freezing either milk or cream, overheating the cream, or by allowing the cream to become too old. The latter is a very common defect, and produces either an acid or a bitter flavor or both. A foul churn, one haunted by the spirits of past churnings, whose remains may still be seen in corners and crevices, and which give the whole interior an atmosphere of other days, may be of interest to the antiquarian as an accumulation of historic value, but the unfeeling public will not pay much for its product. And, again, our city people frequently pay five cents per glass for buttermilk and inconsistently, perhaps, refuse to buy butter which has not been fully freed from it, knowing that in such butter delicacy of flavor quickly gives way to strength.

Three other flavors are old friends, or more correctly enemies, to butter merchants, namely: The poor salt flavor, which will give to butter an oily or fishy flavor in a very short time; the butter-color flavor, which is usually accompanied by the blush of shame upon the very face of the butter; and the strong woody flavor, which the butter absorbs from the package in which it is enclosed, when not guarded against.

The point of excellence next in rank is that of grain and texture. There is a wide range in the demand in this respect, some calling for the hard, dry, waxy butter, which has so much style, which withstands the action of heat so successfully, and "spends" so well; while others desire a piece of butter that spreads easily, filling every pore on a piece of bread, and which melts quickly in the mouth. Upon the degree of hardness no better directions can be given than, "Give your customers what they ask for." Cottonseed produces hard butter; linseed and gluten, soft. Very dry butter may be produced without danger of overworking by absorbing the moisture on the worker with a "wool sponge." The principal defects in grain are in under or over working the

butter, the former producing a watery, pasty mush, the latter a pleasant and harmless salve.

Although not counting for so large a number of points on the score card as either grain or color, in pleasing a customer the item of salt is next in importance to that of flavor. The amount of salt used should be varied to meet the demand which it is intended to supply, and as each maker knows his market, nothing need be said upon that point except to throw out the suggestion that the average salting for the Boston market is three fourths ounce per pound, and that the country demand is for one and one half to two ounces per pound. The quality of the salt is of vital consequence. As previously mentioned, a poor salt has a very powerful effect upon the flavor, and its effect upon the texture is considerable. The particular points to be aimed at are purity, cleanliness, freedom from odors, and, in the case of butter to be sold soon after being made, a fineness of grain, which may be quickly dissolved. Sharp, irregular crystals should be avoided, as they frequently break the grain when worked into the butter.

Color is an important item, and its main requirements are that it should be uniform and natural. The most serious defect in the color is the bothersome mottles, which result from faulty handling on the part of the buttermaker, and which detract from the value of the product sometimes as much as three cents per pound. It is unnecessary to say that butter-coloring should be as free from taste and odor as possible, as the flavor of butter-coloring which we frequently find in butter does not meet any active demand of the market.

The package should be strong, attractive, and securely fastened. Here let me voice the protest of every butter dealer in asking that you do not use the deadly wire fastener. They tear one's hands, and being rusty cause a dangerous wound; they rust quickly and so break easily, and when rusty, stain the tub and make it look old. Every shipment fastened with wire fasteners is at a disadvantage, and nearly every dealer in Boston has signed a petition, asking their shippers to use the tin fastener. In packing butter contact

with the wood should be avoided in every possible manner. Tubs lined with parchment paper are quickly seized upon because of the protection thus afforded to the butter.

PRIZE BUTTER.

There were fifty samples of print butter, twenty-six of tub butter, eleven of granular butter, and eleven of cheeses. The score of the whole butter exhibit averaged ninety-four points, with a variation of only eight and one half points from highest to lowest. The awards were as follows:

Class A—First, H. B. Hough & Son, Lebanon, 95; second, D. H. Foster, Lebanon, 94½.

Class B—First, Albert Corbett, Colebrook, 96; second, H. Richardson & Son, Lewiston, 94½; third, J. M. Pulsifer, Campton, 92½.

Class C—First, A. W. Sanborn, Laconia, 97½; second, John W. Nye, Keene, 97; third, H. C. Smith, Holderness, 95.

Class D—First, Hillside Creamery, Cornish, 98; second, Suncook Valley Creamery, Suncook, 97; third, Wolfeborough Creamery, 95.

Class E—First, Land Lake Creamery, Sandwich, 95; second, Clover Leaf Creamery, Westmoreland, 93; third, C. G. Britton Creamery, Keene, 91½.

Class F—First, Baker River Creamery, Rumney, 98; second, Sanborn's Creamery, Deerfield, 97; third, Westmoreland Creamery, 96.

Granular Butter—First, Ivan Wild, Deerfield; second, C. G. Britton, Keene; third, H. C. Smith, Holderness.

Plain Cheese—First, J. W. Pulsifer, Campton; second, Mrs. James Neal, Tuftonborough; third, H. C. Smith, Holderness.

Sage Cheese—First, J. W. Pulsifer; second, W. C. Pulsifer; third, H. C. Smith.

The butter and cheese were scored by J. Harvey White, Boston.

The exhibit was arranged by Mr. and Mrs. W. D. Baker, of Quincy.

REQUISITES FOR THOROUGHNESS IN CHURNING.

W. D. BAKER, QUINCY.

The subject of churning sweet cream *vs.* ripened cream has been much mooted for the past few years, and as the question has two sides, and each method has both its advantages and disadvantages, it is not the purpose of this article to enter into an extended discussion of the pros and cons.

One fact, however, seems to be agreed upon more nearly than any other, and that is, that at present the market requires only a comparatively small quantity of "sweet cream butter," and consequently the creamery or private dairy that does not have such a demand sufficient to dispose of all these products, and few have any such market, must ripen their cream if they wish to produce an article that meets the requirements of the trade and can be sold immediately to the consumer.

This question of ripening, however, is one of an exceedingly complex nature, and one upon the correct solution of which depends not only the quality of the product but also the quantity, when handled at the usual temperature of churning in most creameries and private dairies.

Having been called upon to make a very large number of tests with the Babcock test during the past few years, many of which were samples sent from creameries and private dairies, the results attained showed in many instances such remarkably large percentages of fat left in the skim-milk and buttermilk, especially in the latter, some samples showing as high as six per cent, it was evident that there was a very large leak that, if it could be in a measure prevented, might make the difference between success and failure.

The losses were usually larger in the samples sent from private dairies than from creameries, but if those sent from the latter were fair samples of the work being done in these creameries, and likewise the others in the state, the losses from this cause alone, if prevented, would have saved enough

to pay all the running expenses and more. I have in mind a certain creamery that at that time was receiving about 10,000 pounds of milk per day, and the skim-milk showed only a very small per cent of butter fat remaining, but when the cream from that milk was churned the next day there was lost in the buttermilk almost twenty pounds of butter fat, which at 20 cents per pound would amount to about $4 per day. In another instance, the loss in the skim-milk and buttermilk amounted to over $9 per day. These figures seem startling, but from careful examination we believe them to be under rather than over estimated. The important question is, therefore, can this loss be avoided?

From the results of several hundred tests made during the past few years, and especially those made at the dairy school at the New Hampshire Agricultural College, I believe that this can be very materially decreased, if not practically avoided.

In these experiments I found that there were quite a number of factors entering into the question, among which were the temperature, time required for churning, the amount of cream in the churn, and the condition of the cream as regards degree of ripeness; and upon a correct solution of these, as well as the churnability of cream containing a greater or less per cent of butter fat, to say nothing of kind of feed, period of lactation and gestation, etc., depended very largely the thoroughness of the churning.

It required very few experiments to convince me that a loss could not be avoided if the churn was filled more than one half full, and thus one factor was eliminated. The kind and quality of feed and the period of lactation, while of great importance to the private dairyman, yet cannot be controlled by the creamery-man, so for the present these may be omitted, and that brings us to three factors, namely: Temperature, ripeness, and per cent of butter fat in cream; or, in other words, thick or thin cream, and as temperature was found to be intimately connected with the manipulation of the cream whether sweet or ripened, thick or thin, this can be consid-

ered in connection with the other two, or rather the three are all dependent upon each other to such a degree that all have to be taken into account.

It was a comparatively easy matter to have the cream at the same temperature each churning, and, by using care, to have the separators skim cream of comparatively the same specific gravity for each churning, but the difficulty lay in determining with any degree of accuracy the proper condition of the cream in regard to ripeness.

As ripeness is usually applied to the cream when in an acid condition, and the degree of ripeness depends upon the amount of acidity developed, it is evident that if some mechanical or chemical test could be applied, that would enable us to determine the degree of acidity developed, we should be in a fair way towards the solution of the problem of thoroughness in churning.

Several mechanical devices were tried, but none were satisfactory, and, therefore, a chemical test was determined upon. A method known as "titration" is used to a considerable extent by chemists in determining the acidity of many different liquids, and it was decided to try this method with cream.

This is not original with the writer, as the method has been employed in two or three cases, notably at the Illinois Experiment Station, and also at the Iowa Experiment Station; but the chemicals used in these instances were better adapted to the laboratory than to the use of practical every-day creamerymen, many of whom have comparatively little knowledge of chemistry and, so far as I know, have not been put to practical use in creameries.

Perhaps it will not be amiss to briefly explain what is meant by "titration." Some liquids are acid,—vinegar for example; some are alkaline,—water in which lime or soda has been dissolved is alkaline; while others are neither acid nor alkaline, and are called neutral,—pure water for example.

Now an acid and an alkali being directly opposite in their characteristics, one will, if used in proper proportions, render the other neutral. That is, if we take some vinegar and put

in a cup, and then pour in some lime water, when just enough has been used the mixture will be neither acid nor alkaline, but neutral. (Illustrate with litmus water, nitric acid, and ammonia.) The question is to determine the exact point at which the mixture is neutral, or, in other words, just how much alkali must be used to neutralize the acid. As you have seen, there are some substances that are of one color when mixed with an acid, and of a very different color when treated with an alkaline liquid. One of these in common use in the laboratory is a substance called phenol-phthalein, which in a liquid form is about the color of water, but when added to an alkaline solution turns pink. Now if we add a few drops of phenol-phthalein to an acid and then add to this an alkaline solution, as soon as enough has been added to make the mixture slightly alkaline, it will turn a pink color; and if the exact strength of the alkaline solution is known and the same strength is used in each case, the relative degree of acidity in any liquid can readily be determined by the quantity of the alkaline solution it requires to neutralize the acidity.

In our experiments we used for the alkali a deci-normal solution of caustic soda, that is, a saturated solution of caustic soda reduced to one tenth its strength by the addition of distilled water. Any pure, soft water, however, will do just as well. This solution is comparatively inexpensive, and can be used by any one.

The test is as follows: Take fifty cubic centimeters of cream (this can be easily measured by using the acid measure that comes with the Babcock test), put it into a shallow bowl (an oatmeal bowl for instance, such as can be obtained at any store for five cents), adding about five drops of phenol-phthalein; this is then placed under a glass tube, called a burette, in which has been placed fifty cubic centimeters of the caustic soda solution.

This burette has a valve at the bottom, which can be opened or closed quickly, and is marked like the neck of a Babcock test bottle into cubic centimeters and tenths. Now allow the solution to run slowly into the cream, stirring constantly with

a glass rod, until the cream becomes slightly pink in color; stir a moment, and if the color disappears, add a few drops more of the solution, until the color is permanent, care being taken not to add more than is absolutely necessary.

This does not measure the acidity of the cream, but the numbers on the burette will indicate just what quantity of the solution was required to neutralize the acid in the cream. For instance, if it took thirty cubic centimeters in one instance and forty cubic centimeters in another, it would indicate that the latter was one third more acid than the former.

In our experiments, the acidity of the cream was tested as soon as it was put in the churn, and a record kept of the temperature of the cream in the churn of the churn room, of the time required for churning, the temperature of the buttermilk, etc., as well as the number of pounds of cream in the churn.

During the work a large amount of data was collected, and out of these I have prepared the following table of results:

CHURNING TESTS.

Temperature.	Acidity.	Pounds cream.	Time, minutes.	Temperature buttermilk.	Per cent fat in buttermilk.	Temperature.	Acidity.	Pounds cream.	Time, minutes.	Temperature buttermilk.	Per cent fat in buttermilk.
48	21	64	45	54	.3	54	29	93	48	54	.1
52	20	78½	45	54	.3	51	29	91	23	54	.1
48	24	70	43	55	.2	53	29	97	26	55	.05
52	24 6	82½	50	55	.3	50	29.4	151½	55	53	.1
51	27	37	34	53	.1	52	29.4	112	55	56	.1
54	27	74	34	54	.15	52	35	100	31	55	.1

From an examination of the foregoing table it will be observed that when churned at a comparatively low degree of acidity, there was considerable loss even when churned at a very low temperature, and that at twenty-nine and above there was a comparatively small loss, although there were four degrees variation in temperature. The cream was quite thick, containing from twenty-eight to thirty per cent butter

fat, which explains the low temperature of churning, as from numerous experiments it appears that as a rule the thinner or riper the cream, the higher should be the churning temperature, while the thicker or sweeter the cream, the lower the churning temperature to obtain the best results for both quantity and quality.

These results which were attained were where normal milk, or milk containing about four per cent of butter fat was used, but the creamery-man occasionally, and sometimes more than occasionally, meets with a very serious obstacle to thorough churning, and that is poor milk. By this I do not mean milk containing a very low percentage of butter fat, but milk of positively bad qualities, which produce a very decided effect upon the churnability of the cream, and when milk of this kind is allowed to get into the tank no end of trouble is the result.

In creameries where the cream is gathered, this trouble is more frequently encountered, and as the cause is much farther advanced in the cream than in the milk, there is a correspondingly greater difficulty in handling the product. Some of these forms which are met with are "blue milk," "bitter milk," "soapy milk," "slimy milk"; and in cream, "bitter cream," "alkaline cream," and cream in which there has occurred a butyric acid fermentation.

It is now generally recognized that these unfavorable conditions are due to the presence of minute organisms, called bacteria, although the food may have more or less influence as regards bitter milk (as the flavor obtained from feeding spoiled or sour ensilage, onions, leeks, turnips, etc.), and if these unfavorable bacteria can be eliminated or prevented from getting into the milk, or the milk kept at a temperature unfavorable for their development, the trouble can be mainly avoided.

These organisms act upon the milk in various ways, but as a general thing the bacteria, which by their action upon the milk sugar cause what is called lactic fermentation to develop, thereby producing lactic acid, which is the cause of sour

milk, are present in sufficient numbers to stop the propagation of other kinds by the acid formed.

In all these instances an "ounce of prevention" is worth pounds of cure, but the question is, how can a loss in churning be prevented or at least be largely decreased when these unfavorable conditions are present?

I know of no remedy where the milk is what we term slimy. Such milk will furnish no cream when the gravity system is used, and if run into the separator will soon clog it, and neither the product nor the whole milk can be churned. Milk of this character can usually be detected if present, and the only way to do is to reject the milk from the dairy or dairies furnishing it until an investigation can be made, and the cause removed when found. Sometimes the milk from a single cow will be sufficient to contaminate that of the whole herd, and when this cause is removed, the trouble ceases.

In regard to blue milk the following, which is taken from a bulletin of the agricultural department, is of interest:

"This fermentation, characterized by the deep blue color which has given it its name, occurs sometimes as an isolated trouble in individual dairies and sometimes it has become so prevalent in certain localities as to be almost an epidemic. The explanation now given for blue milk is a double one. Ordinary milk contains some of the lactic acid organisms, and these, acting in connection with another species of bacteria, produce the brilliant blue color which characterizes this infection. When growing in ordinary milk, the effect of this organism is very marked. For a few hours no change is noticed, but just about the time when the milk begins to become acid some intense blue patches make their appearance. The faster the acid forms, the quicker the coagulation appears and the smaller are the blue patches, while if the acid is produced more slowly, the blue patches are larger and of a better color.

"Where the blue milk organism comes from is unknown, nor have we any knowledge of the causes of the occasional epidemics of blue milk. There can be little doubt that the cause is always some unknown source of filth. In some cases

the trouble has been traced to a single cow in a large dairy, and has been easily stopped by isolating the individual found to be the cause, or by carefully washing the cow's teats with a little weak acetic acid solution.

"Blue milk appears to be harmless. It has been fed to animals, which eat it readily and without harm. It is, however, not suitable for use in the cheese factory, as the blue cheese, which is sometimes met with, has been attributed by chemists and bacteriologists to the same organism that causes this trouble in milk."

Soapy milk, so called on account of the soapy taste and the readiness with which it frothed or sudsed, is sometimes met with. Such milk is alkaline and does not sour, and is very difficult to churn, and the quality when any butter is obtained is so poor that it is labor lost to bother with it. In one instance I tried to overcome this alkaline condition by the addition of weak hydrochloric acid, and the churnability of the cream was very much improved; but the butter was not such as our New Hampshire creameries wish to produce. The safest way is to remove the cause, which is said to be a kind of bacteria, which was found on poor straw or hay used for bedding; and in the instances referred to, the milk was all right when the cause was removed.

When, however, the milk or cream has a bitter taste, or has acquired the flavor of certain kinds of food, the remedy is in pasteurization, and then properly ripening either by the use of a starter as usual, or some reliable lactic ferment, of which there are several brands now upon the market. Care should be used to pasteurize the milk or cream, not sterilize it.

This method is now employed in some of our best creameries, and, as a rule, has been very successful, especially where some preparation has been used to "inoculate" the pasteurized cream with the desirable bacteria. A preparation commonly called B. 41 is used in many creameries with excellent results reported.

This method not only makes better butter than could be made from the tainted milk or cream, but has a marked effect

upon the churnability by removing the elements that if allowed to propagate would render anything like thoroughness in churning almost impossible.

In conclusion, allow me to say that I have only briefly touched upon this subject in this paper, and that there is a most ample field open for investigation, and if what I have presented shall be the means of stopping some of the leaks in our creameries and private dairies, and thus aid in making the leading agricultural industry more profitable, and thus promote the welfare of my fellow dairymen in the old Granite State, I shall feel that my labor has not been in vain.

GRANITE STATE DAIRYMEN'S ASSOCIATION.

OFFICERS, 1898.

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ANNUAL MEETING, ROCHESTER, NOV. 30, 1896.

ANNUAL ADDRESS.

PRESIDENT J. M. CONNOR.

Fellow Dairymen, Ladies and Gentlemen:

As we meet in annual convention, to treat upon and discuss subjects pertaining to the leading agricultural industry of our goodly state, we are prone to regard it as somewhat threadbare; that most of its paths are pretty well trodden. While there may be a few in every town, progressive, up-to-date men, who understand well the leading points in dairying and milk raising, and practice what they know, there is yet a larger class, who, while they may have a tolerable idea of good methods, yet from lack of confidence and business push, fail to make available what their better judgment teaches; still another class, decidedly too numerous, little influenced by their surroundings, treading the paths of by-gone days, men who would succeed nowhere, and fortunate it is for them that Mother Earth has almost exhaustless resources to feed such as they.

Notwithstanding, within the past fifteen or twenty years there has been an almost complete revolution in dairy methods, yet we are not to rest with our present attainments. In some particulars, we have rushed headlong into schemes that may need revision.

It requires a large discrimination to guard against overproduction. The great milk industry furnishes ample evidence in this direction. The farmer living seventy-five or one hundred miles from Boston ought to deliberate well before changing his farm methods for a business where the excessive freight rates reduce his profits so much below those more fortunately situated. In the transportation of no other farm products does he encounter such odds.

Again, the creamery system presents some questionable features. The hauling of whole milk every day through storm and sunshine, snow drifts and mud, over long distances to the factory to have a small per cent of its contents extracted, returning with the bulk, looks like a hard and tedious process for man and beast. Many a private dairyman has dropped a good class of customers, not only for his dairy products, but for his poultry, eggs, and numerous other products, that he might get relief from his burdens by hauling his milk to the factory and back again. The circuit of the creamery plant might be greatly enlarged by establishing separator stations. Again, most patrons keeping ten cows and upwards would find it for their benefit to purchase and use a hand separator, so that a portion of the year, at least, separations could be performed at home, obviating this ceaseless carting of milk all weathers and conditions of travel.

We are firmly of the opinion that adjacent to all our cities and villages of any importance, private dairying ought to be encouraged. The hand separator, or the one driven by light power, has brought it within reach of all intelligent dairymen, to establish miniature creameries, where the best butter can be made and at greater profits, all things considered, than can be realized by sending the whole milk from three to ten miles and getting creamery prices.

Wherever you find dairymen of this class selling their butter directly to the consumers, along with other farm products, you will find the most prosperous class of all. Not all can do this, only those adapted to this work. But the trend of sentiment of late years has been against it. Men high in dairy authority have figured out the expense of home-making and marketing to be eight cents per pound, or about double the average cost at the creameries. I can offset this assumption only by my own experience. My annual product of butter is about three thousand pounds; after milking (which is the point from which we start), about twenty minutes each morning and night is consumed in separating the cream from the milk; about two and one-half hours each, twice a week, is con-

sumed in churning, working, and printing, together with the labor of one member of the household; about seven hours each week is consumed in going eight miles marketing poultry, eggs, and all other farm products going along with it. At eight cents a pound, as figured by high authority, the making and marketing of the quantity of butter would amount to two hundred and forty dollars a year, a sufficient sum to hire a good farmhand the entire year.

Now let us look at the creamery side. While I am spending some forty minutes daily in separating, he spends from one to three hours drawing his milk to the creamery to get the same work done. It costs him on an average four cents a pound to get his marketing and making done at the factory, and he gets only the wholesale price for his products. He must furnish his milk at the stations at stated times, and all weathers; I do mine at my own convenience.

Do not understand me as undervaluing the factory system. It has done much to elevate and systematize the dairy industry. It is a godsend to that large class who lack the elements of success in any branch of farming. It came to New Hampshire in the period when she had little reputation as a dairy state. It came when the dairymen of this state had crude implements for their work, and still cruder notions about breeding, feeding, and handling the product. But today, thanks to inventive genius, dairymen of skill and energy can have a miniature creamery of their own.

What means shall be used at this session,—which is devoted to agricultural discussions, and efforts to awaken thought,—to stimulate our New Hampshire dairymen to more energy and activity in this industry. If we are to be true to our purposes, let us encourage those who have the ability and surroundings to take up this work and master the situation. It is an acknowledgment of lack of ability and business tact, to shift a portion of this dairy work on to another.

Let me call your attention briefly to a point where we fail in our agricultural teaching, in our dairy instructions. It is that we do not get right down where the man is in his common

every-day work. This is just where our agricultural colleges and experiment stations fail. They deem it beneath their dignity to follow him in the every-day detail of his affairs, just where he needs instruction, just the source of all his failures. The great trouble is just here, and I want to emphasize this fact, that too many of our institutions in dairying, and in all departments of agriculture, never had that long continuous application in the detail of farm work, its trials, its failures, its lights and its shades, to enable them to know just where the timely word is needed. Agriculture is intensely practical. How then can the man who spends his youthful days in schools, rounding out his period in college, and becoming a professor in some agricultural college, be expected to impart the instruction so much needed?

Our state institutions and men of wealth and leisure may have fine bred herds, carry on a system of intensive farming, but what avails all this beyond the evidence it furnishes of the power there is in money?

We plead for agriculture, because it is the only calling of men that brings into full play and use all his physical and mental powers. We plead for dairying, because that out of all the specialties in farm life, this ranks the highest. The breeding of fine points in the cow, all the nice distinctions in her feeding, care, and training, that delicate product of hers containing so many life sustaining elements, all the nice manipulations required to produce the golden butter, its sale with other products of the farm,—all this calls into active use a larger class of faculties than any other known profession or employment. Call this menial! Call this drudgery! Whence comes the sentiment so prevalent among the rising generation, that this noblest of all occupations is to be shunned, avoided, is unpopular? How comes it about that hardly a young man can be hired upon our farms who possesses ordinary intelligence, that can be trusted with the most common duties? Ten chances to one he will be proficient in the rules and lingo of baseball, and his literary taste will lead him to study the game pages, rather than the agricultural department, in the newspapers.

Fellow Dairymen and Friends of Agriculture: Whilst we may be more familiar with many scientific truths, and be better able to give a reason for the faith that is in us, yet is it not true that we are drifting away in certain lines, greatly to the detriment of agricultural progress? Is not our farming too superficial? Is not the tendency of the use of agricultural machinery and commercial fertilizers towards this superficial state?

Can you not call to recollection many farmers who, as the saying goes, are making one hand wash the other, going to the station or factory with the product of the cow and loading back with foreign products with which to feed her? The farm is not self-sustaining. If it only were, the farmer would have some margin left.

The difficulty lies just here: There is not help enough on these farms, and it cannot be obtained of such a character as to warrant the attempt. The old saying yet holds good, that "He who by the plow would thrive, himself must either hold or drive." If he should surrender both to the average hired help, he would soon be driven over the hill to the poor house. If he attempts to do both on a hundred-acre farm he will fare equally as bad.

HANDLING AND MARKETING MILK.

JOHN B. BOWKER, ESQ., WORCESTER, MASS.

When I received the circular stating that there would be an address upon the subject of "Handling and Marketing Milk" at this meeting by John B. Bowker, ex-manager of the New England Milk Producers' Union, I was somewhat surprised, and a reporter of one of the daily papers in my native city being present at that time, I handed the program to him. And after looking it over, he remarked that the announcement was not properly worded. It should have been "The Handling and Marketing of Milk by an X-Ray."

I have been given to understand that my part of the program was to take the milk after Secretary Winslow had got

through milking his Ayrshire cow, and so care for and sell it that Brother Winslow would receive enough to pay for keeping his cow, and in addition receive something for his labor. This problem confronts the New England farmer with greater force each succeeding year. Skill requires still more skill. The more skillful we become in the methods of producing milk, the more skill is required in the successful care of and marketing of the milk. To make the cow give a paying quantity of milk requires a skillful man. The proper handling of the milk requires a cleanly man. To sell that milk profitably requires an intelligent man.

Every New England farmer is born heir to the usual amount of native Yankee wit and wisdom, and if these traits are properly trained from youth up, we have the successful and money-making farmer. The saying that "Cleanliness is next to godliness" should be posted in every conspicuous place on the dairy farm.

Cleanliness is the most important factor in the milk business. The man should be clean, the barn clean, the cow clean, and the milk utensils clean. For years we have been told that milk takes disagreeable odors and retains them more readily than most anything else that could be named. And we have been truthfully told that promptness in removing the milk from the cow stable to the milk house or cooler is of the utmost importance. Every receptacle in which the milk is put should be thoroughly clean, and sweet, and cold, and so far as possible should be placed where no odors can even reach the receptacle in which the milk is placed.

My sympathy is with the small farmer who has from four to six cows. He is nearly always overlooked when matters of this kind are considered, and when improvements which are expensive and can be afforded by only the large dairies of thirty or forty cows are suggested, and we are told by speaker after speaker that these improvements should be required of all. This is wrong, very wrong. The two or four or six cow dairyman has an undeniable right to sell his product in competition with all others, and on an equal footing so long

as he produces a product of equal quality. He has the right to refuse to carry out any suggestion or demand which would require the outlay of any amount of money upon which he would not receive a proper return for the outlay required. And any one who is the true friend of the farmer will study out and devise only the most economical plan possible which will accomplish the desired result.

A milk house apart from the barn or house of course is a desirable thing, but all cannot afford it. That the milk should not be turned from the pail to the can in the cow stable or the living rooms of the house should be apparent to all. Neither should the cans or milk cooler be left in those places during milking time or at any other time. Many of the small farmers have ice houses attached to either the barn or the house in a convenient location. A few boards and nails and a small outlay of labor would partition off a portion of the ice house, and the cans, cooler, mixers, etc., could be kept there, and the surrounding ice pack would be no drawback by any means; the thickness of the walls in winter and the storing of the ice in summer tending to keep an even temperature throughout the year. If no ice house, then partition off a small portion of the woodshed sufficient for the dairy utensils and the milk to be cared for, and when you have the place fixed, wherever located, do not make it the general repository for everything else which seems to be out of place upon the farm. There will be a mighty temptation to do it, but resist, even if it be necessary to put a placard over the door "For milk only."

Every farmer knows what is right, and every farmer, knowing his location and its possibilities better than any one else, and knowing what is necessary, can be relied upon to adopt that which is best considering his surroundings and circumstances.

Milk should be thoroughly cooled as quickly as possible after being drawn from the cow, and kept at a low temperature. I believe that the most healthy and best selling milk in the future will be that which has been promptly cooled and kept at a low temperature.

A great stir has of late been made by some of our scientific friends who have become exceedingly alarmed at the dangers which may be contained in the milk supply. They have issued war-cries and started scares on about every other commodity of food until they are worn out, and now in order to support their scientific investigations go back to the product of the meek and gentle cow and the honest hard-working farmer. A huge cry has lately been raised in Boston, and I believe if the truth of the matter could be ascertained, that our scientific friends would find more death-dealing germs in the backyards and in the water which is drank every day than in any milk which has ever been sent into the city of Boston. The milk which has been drawn from the cow upon the farm and fed to the farmers' children, and which has built up the happy, red cheeked, light hearted, robust, and lusty young man and woman, cannot under any common-sense rule have any other than the same, or at least a good, effect upon the health and growth of the children of man in our large cities, provided that this milk can be fed to the city children in the same condition as it is fed to the boys and girls upon the farm. That being the case, does it not behoove our scientific friends to cease branding the farmer as a criminal, and his cow as the originator of disease, and try some practical remedy which will insure quick shipment and prompt delivery, so that the least possible time shall elapse between the milking of the cow and its consumption by the people of our large cities?

Dr. Alexander Bernstein, of Berlin, Germany, at the meeting of the Boston Homeopathic Medical Society in Boston, read a paper a short time ago on milk from the sanitary point of view, and after a careful and exhaustive treatise upon the subject, considering the milk in all its many conditions and forms, summed up as follows: 1st. The milk should in appearance and taste resemble newly drawn milk as much as possible. 2d. The value of the milk as food should not be impaired nor should any objectionable substance be added to it. 3d. No germ of dangerous character such as might pro-

duce infectious disease should be contained in the wilk. 4th. The treatment of milk must not materially increase its price.

At this lecture Doctor Bernstein also exhibited five flasks of milk subjected to different temperatures, the flasks having been thoroughly sterilized and rendered absolutely clean before the milk was placed in them. Flask No. 1 had been on ice during three days. Flask No. 2 had been kept in a room of average temperature of seventeen degrees centigrade during the same time. Flask No. 3 contained milk which had been heated to seventy degrees centigrade for one half hour, and then kept five days at room temperature. Flask No. 4 contained boiled milk, which after boiling had been kept in a room for seven days. Flask No. 5 contained milk which had been in a steam chamber for five consecutive hours. A careful examination revealed the fact that, as an article of food, the best, from both the standpoint of health and desirability on account of its pleasant taste, was that milk which was in flask No. 1, and in which no alteration had taken place. All the others showed more or less alteration in the form of the milk, and some had an exceedingly obnoxious odor or taste, so much so in some cases that they could not be sold to any person unless they were in a state of starvation. It was also proved that there was the least danger to the human race in milk cared for after the manner of that in flask No. 1.

We have heard a great deal about sterilized milk, and some of our scientists have favored its compulsory introduction. Such milk must necessarily be sold in bottles, which are hermetically sealed in order to prevent reinfection from outside germs, and this entails considerable increase in the price of milk. If dangerous germs should come in sterilized milk, they find an unoccupied field, and their multiplication is by far more rapid than in ordinary milk. For example: Cholera germs entering into ordinary milk will soon lose their vitality, as they cannot stand the competition of the lactic acid bacteria, but cholera germs put into sterilized milk multiply very rapidly; therefore, in both the light of common sense and in the light of true science, the milk which, when drawn from

the cow, is promptly cooled and put into clean, cold receptacles and so kept until delivered, is the most economical and most healthful which can be devised.

It is a mistake to close up tight any receptacle in which milk has been. Take a new can, fill it with milk and keep it for twenty-four hours, then empty the milk, wash your can thoroughly and scald it, put in the stopper tight and let it stand for several hours, then remove the stopper, and the smell from the can will be nauseating in the extreme, and no one should desire or be allowed to put milk into a can in that condition. Milk put into such a can can but be a poor and perhaps a dangerous article of food, to say nothing of the danger to its keeping qualities, providing it be shipped to any distance. And if the boards of health really desire to benefit the public, let them commence in some practical way instead of bringing out their branding irons with the word criminal and try to chase the farmers up and down these New England states by asking for the passage of laws for the infliction of fines and imprisonment upon suppositious and superstitious ideas, which fail to exist in fact. Let the boards of health of our large cities see to it that the empty can be not stopped up tight and stacked up in tiers in the milk cars. Let them order every can rinsed after the milk is emptied from the can, and when the cans are put in the milk cars let them be placed mouth down on racks, which will permit of the free circulation of air through the stack of cans in the car, and let the stoppers be kept by themselves until the stations at which the cans are to be put off are reached, when the cans and stoppers can be put off separately. And when the boards of health have accomplished this, there are other practical reforms out of the power of the farmers to accomplish, to which they can turn their attention to advantage. And when they have shown the farmers that they are believers in and can accomplish a few practical reforms which are a seeming necessity, we may in years to come be led to adopt some of the more intricate ideas so loudly and willingly advanced by them.

I believe that the best days of the old milk can have been

seen, and that the farmers should look forward to a better agent as a carrying receptacle, and I shall expect to see either glass cans, which will show plainly from the outside whenever they are not properly cleaned, or else paper cans, which can be packed in the flat until used, and when once used thrown away, to be given with the milk, as the little paper receptacles are given now when we buy oysters at the market. These things are bound to come. The question is how and when, and whether glass or paper. And it is a good plan and for the interest of the farmer to hurry on the new idea. Whether peddling milk in the near-by towns by the producer himself, or the sending of milk by him to the creameries, or the sale of his milk to the large contractors in distant cities, the great rule is in all cases alike, and in all cases to be lived up to. It is cleanliness, yes, extreme cleanliness, however it may be obtained. At all times and in all places, it is the greatest, and I might almost say, the only guarantee of the keeping quality of milk, and its fitness as an article of food. Of course, it is an important problem to get milk from the cow. It is a more important one to properly care for it. It is the most important one to successfully market it at a paying profit.

Whenever it is possible so to do, I believe the best paying method is to peddle your own product. This is not convenient or possible in many cases, but whenever it is do it. It is the most profitable method year in and year out, and when I say peddle your own product, I mean every word of it. I mean drive your own cart and make the change yourself. There is the most profit in it that way. Your hired man may be pretty good, but he is not as good as you for your business. There are other things he can be doing at a greater profit to you than driving your milk wagon.

The next method is the creamery or by making butter on your own farm. If you know how and have a market near by, make it on the farm; otherwise, take your milk to the creamery, and when taking it to the creamery keep watch of the prices in the butter market. It will prove a satisfactory

plan to provide some way of keeping posted as to the price, for when you put your milk or cream into a creamery you have a right to know what is going on, and whether the business is being run properly and sales made to the best advantage or not. So far as possible the skimmed milk should be kept on the farm. Its value when properly utilized can never be fully calculated or realized.

Another method of marketing, and I believe the most unsatisfactory, is the shipping of milk to milk contractors in the large cities, and should never be considered whenever any other avenue is open. It may seem a saving of labor to have the milk all taken care of in this way, but it is a distinct loss to the farmer. But that it is in many cases a necessity is evinced by the fact that nearly 3,000 farmers in this state are sending milk to Boston contractors alone. Some of them have been sending it for years. Others for but a brief period of time. The usual plan of the contractor is in the beginning in a new territory to buy milk at a straight price, that is, to take all the milk the farmer will make at an agreed price. This price as a rule is slightly higher to begin with than the farmer has been receiving, and the milk is secured by the contractor. This goes on for a year, perhaps longer, then the milk is brought under the surplus clause. That is, the contractor agrees to pay a stated price provided he can sell all of his milk, but in case he does not, the producer is obliged to have the surplus made into butter or cheese by the contractor, and pay that contractor for so doing. The butter and cheese is sold at the market price, and the farmer receives for that portion of the milk which the contractor could not sell as milk, what the contractor says it was worth for butter or cheese, less the price for the making, which is to be paid to the contractor. So that in recent years, the price received by the producer has been from one and one half to two cents per can less than the card price, or the price agreed upon. And the producer awakes to the situation, alas, too late, to find his home market that he used to have usurped by others, his former dairy utensils sold or lost or useless, the creamery that

he used to patronize closed because his neighbors followed his lead. And he finds that the cost and extra labor of starting in again to get back and supply his old market or revive the creamery, if that, too, is not in the power of the contractor, is seemingly so great that he concludes to send his milk another term to the contractor, in the delusive hope that the surplus may be less, or that there may be a more favorable opportunity to stop. And so he goes on and on from bad to worse, more surplus and less price, always in the hope that something better may turn up, or that there will be an upward turn in the market in the future. What is to be done about it?

No matter what our condition, we are all striving to better it. No matter how we sell our milk, we all want to know how we can get the most out of it, the greatest profit. If you are peddling milk, put it up in the neatest and most attractive form. Strive to improve the quality. Make and sell a better quality of milk than your competitor. You can thereby secure the best class of customers, those who pay best, and sooner or later, as the reputation for the quality of the milk becomes established, receive a better and more remunerative price for your milk. If making butter, the better the quality of the milk the more profit in the making of the butter. And the butter when ready for the market should be in the most desirable and attractive shape possible. If sending your product to the creamery, the quality of the milk should count just the same and be productive of a better price. Milk or cream should be bought and paid for according to its quality; the better the milk, the better the price should be. The creamery should be able to make the butter at a price not exceeding two and one half cents per pound, and a good selling agent is a necessity.

Every producer who sends milk to a creamery should have an interest in it and a voice in the management. He will then feel some responsibility in the matter, and look after the details more closely than he otherwise would. Quality of milk counts, too, with even the contractor, and he even will

make some concession rather than lose the milk of a producer who sends in milk of an extra quality. Most all peddlers in the large cities who buy milk of the contractors have their particular dairies, which are marked for them, and there is trouble at once if for any reason an extra good quality dairy fails to come, or the number of cans per day decreases.

In selling your milk to the contractors who are at such a great distance from you, and where so many of you are shipping milk as are shipping into Boston, it is an absolute necessity that some form of organization shall be adopted by you to preserve your rights. Where your interests are at stake you have a right to know about the financial standing of the concerns to which you ship your milk. You have a right to know as to how that milk is being sold. You have a right to know whether your interest, as well as the contractor's interest, is being equally considered, and you will pardon me if I say a word at this point in regard to the work done by the New England Milk Producers' Union. It is an old and true saying that "An ounce of prevention is worth a pound of cure." And I know that while it has not cured all the ills, it has prevented many from being imposed. To the producers of the New England states it is a great protection. It has got well under way. If kept up and backed up by the producers, it can do better work another year than has ever been accomplished before. And by having and standing by an organization of this kind is the only hope which those farmers who are forced to sell their milk to contractors have of securing anything near a living price for their product.

Previous to this year the number of producers shipping their milk into Boston was unknown to the farmers. The rate charged the contractors by the various railroads for carting this milk has not been known. The commission which the contractors have been getting for the sale of this milk has simply been a matter of guess-work, and in order to sell your milk understandingly, it is necessary for you to know these things. And in order to do this a large and powerful organization has been formed. "In union there is strength."

Those producers who ship their milk to the contractors in the large cities, and especially in the city of Boston, have a right, and should demand an agreement in writing as to the price for milk for each term of months for which it is sold, and in this agreement should be stated any conditions which are to be observed by either party, and a schedule of rates from the various points, according to their distance from Boston, should be specified. You have a right to know whether or not they are selling this milk for you and charging a commission and they acting simply as your agent, which should in all justice give you a right to examine all their books and accounts to see if you are being returned a proper amount for your product. If they are not selling it upon a commission, then they have no right to expect you to sell it otherwise than the owner of any other kind of goods would sell his property to any one desiring to buy it.

The cost of transporting that milk to the market should be stated as well as their commission for selling, if it is to be sold upon a commission, and while not connected with the union, I believe it has benefited the farmers more than can be calculated at this time in an absolute money value. I believe it is your only safeguard in the sale of your milk in the large markets in the future, and if you would protect yourselves and your interests you must sustain it.

And in conclusion let me say that this entire matter can be properly divided under three heads, and if those who are engaged in the production of milk for a livelihood would remember them, there seems to me but little if any doubt that milk can be handled and marketed, provided Brother Winslow's cows can be depended upon to give it, at a paying profit. These three heads are: Cleanliness in its care, promptness in its delivery, and intelligence in selling.

THE THEORY AND PRACTICE OF BUTTERMAKING.

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The good or bad qualities of a sample of butter are usually divided under the head of flavor, body or grain, color, salting, and finish. The comparative values of these qualities is fixed by most judges at 45 per cent for flavor, 25 for body or grain, 15 for color, 10 for salt, and 5 for finish.

It should be our business then, as buttermakers and caterers for one of the most dainty of foods, to make ourselves thoroughly familiar with the requirement of our markets and the demands of the public taste on the one hand, and to study carefully the conditions which affect these qualities during the process of production and manufacture on the other. Our standards should be fixed, not according to our own ideas, but rather in accordance with the ideas of the people who pay the money for our goods, and are thus entitled to first consideration. How many seem to forget this fact, and continue to do things as they think is right, trying to force upon people that which they do not like.

It is not the purpose of this paper to set up any standards, except in a general way, but rather to discuss some of the principles underlying the work of buttermaking, and if possible make clear why certain results follow certain modifications in the process.

If we consider these qualities separately, flavor, being the most important, naturally comes first. The flavor of butter may be either good or bad, desirable or undesirable, but in either case the derivation is much the same. The flavor of butter is derived from three principal sources, viz., the food eaten by the cow, the period of lactation, and last but not least, the action of bacteria, or in other words the fermentations which take place during the ripening of the cream.

That the food has a marked influence on the flavor of butter will hardly be denied by the buttermaker who has tried to

make a first-class article from milk tainted with turnips, garlic, leeks, or other strong-smelling foods. It is well known, I think, that the herbage of certain sections imparts to the butter a distinct sectional flavor. I have made butter on the dry plains of the West, where the "sage brush" grows so plentifully, and could always detect the characteristic odor of that plant in the butter. I am satisfied that we have a good deal to learn yet as to the full value, in this respect, of different kinds of food. We have, heretofore, confined our attention largely to those foods which exert a bad influence on the quality of the butter, losing sight of the fact that there may be considerable difference even among foods usually classed as good. Then again some foods are often blamed for giving rise to bad flavors, when it might more properly be laid to injudicious feeding or other causes.

I have heard men assert that the flavor of milk, and consequently the butter made from it, was injured by the feeding of corn ensilage. I do not believe that good ensilage properly fed will have any bad effect, but I do believe that milk will absorb the odor of ensilage if exposed to it for any length of time. Right here let me say that a great many people make the mistake of thinking that warm milk will not absorb odors, but it will, in some cases, more readily than cold milk. The feeding of ensilage has been blamed in this way for what is due to carelessness in leaving the milk exposed in the stable, where the air is heavily charged with the smell of the silo. Some foods, first-class if fed in moderation, will, if fed to excess, induce indigestion, which, in turn, spoils the milk. But this is a feeding question rather than one of butter-making.

That the period of lactation affects the flavor of butter we know, because we find we can make a finer flavored article from cows fresh in milk than we can from those nearly dry, other conditions being the same.

As regards the action of bacteria and their influence on the flavor of butter, one has only to think of the difference between sweet cream butter and that made from ripened or

sour cream, and then consider that this difference is wholly due to the growth of these minute plants in the cream during the process of ripening, to be convinced that bacteria play a very important part in fixing the flavor of butter.

The temperatures employed, during the handling of the cream or making the butter, have a very decided effect on the grain, high temperatures making it soft, while too low a temperature gives it a "tallowy" consistency. Of course, overworking is a common cause of injury to the grain.

As regards the color, it is impossible to lay down any standard. The English market, which is so much sought after, demands a very pale shade, while local tastes favor a more pronounced color. Among the faults of color we put such things as mottles, white specks, and white thread-like streaks, —three things much confused, but all due to different causes, and the result of bad buttermaking, as we shall presently see.

Salting is also a matter of taste, and the buttermaker must be guided by the wishes of his customers.

Having said so much by way of introduction, let us turn now to the practical consideration of the subject. Time will not permit me to dwell on the separation of the cream from the milk, about which a good deal might be said, even though it is more or less of a mechanical operation. We cannot pass over the ripening of the cream so lightly, however, because here we have one of the most important parts of the process.

We hear a great deal nowadays about pasteurizing cream. It is said that a large proportion of the Danish butter is made from pasteurized cream. It has been tried in Canada, but chiefly in an experimental way. The pasteurization of cream is based on the theory that a temperature of 158 degrees Fahrenheit destroys most of the bacteria which develop in milk or cream, and thus leaves a clean "soil" for the introduction of the proper "seed" in the shape of a starter.

In practice, however, it is somewhat difficult to heat a large body of cream to a temperature of 158 degrees without heating some part of it to a higher degree, and then there is trouble with the cooked or boiled flavor. In fact a "cooked"

flavor will be noticed at 158 degrees, but it passes off after cooling. The cream must be cooled quickly after being heated for ten or fifteen minutes. When the appliances for doing this work are brought nearer perfection than they are at present, the labor and attention required may be much lessened.

In the meantime, my advice to buttermakers is, go a little slow, and do not attempt this sort of thing unless you understand thoroughly what you are undertaking, and are sure you will be able to carry it out properly.

The use of a "starter" in buttermaking is all but universal. If the cream is pasteurized, a starter is an absolute necessity. I do not think that the flavor of butter made from good pure milk can be much improved by the use of any starter, but in creamery work there is always some milk not quite up to the mark, if not positively bad. In such cases a starter prepared from some of the best milk is a decided advantage. A great deal has been claimed for the "pure culture" starters, so called, and I have no doubt very beneficial results have followed their use, but I am inclined to think that much of the improvement is due to greater care exercised in handling the cream. It is natural that if a man tries anything of the kind, he will take a little more pains and watch it more closely.

Another point in favor of the starter is that it enables the maker to ripen the cream at a lower temperature; bacteriologists tell us, and experience confirms it, that a temperature of about sixty degrees Fahrenheit is favorable to the development of the best class of fermentation in ripening cream.

Before we touch upon the question of churning, it may be well to refer briefly to the character and composition of butter fat.

Every body knows that the fat in milk, and in cream before churning begins, has the form of tiny globules invisible to the naked eye. It does not consist of one single fat, but a mixture of several kinds, which may be divided into two classes, viz., fixed fats and volatile fats. The latter form only

a very small part of the whole, and probably have more to do with flavor than bulk. The fixed fats are divided by Blyth as follows: Stearin and palmitin, 50 per cent; olein, 40 per cent; butyrin, 7 per cent; other fats, 3 per cent; total, 100 per cent.

Stearin is a hard, white fat which melts at 151 degrees Fahrenheit. Beef and mutton tallow are largely composed of stearin. Palmitin is also a hard, white fat with a melting point about 12 degrees below that of stearin. It is found in palm oil, etc.

Olein is an oil at ordinary temperatures. These three fats are very common in nature, but the next, butyrin, is found only in butter, and is the characteristic fat of milk. Oleomargarine contains no butyrin.

When cows are on dry feed there is a larger proportion of the hard, white fats in the butter, while such foods as grasses, silage, etc., produce more of the oily fat. This explains why butter is usually harder and whiter in winter. For the same reason we have to use higher temperatures in churning in the winter time as a rule. It is thought that the fat is in a liquid condition in cream, and solidifies as a result of the agitation in the churn, when the globules begin to adhere to each other.

When churning proceeds too rapidly as a result of too high a temperature, only part of the fat is solidified, and the balance, or part of it, is incorporated with it in an oily state; hence, the reason why such butter is always soft and greasy.

It is obvious from the foregoing that no fixed temperature can be laid down for churning. It must be varied according to conditions, but should always be done at as low a temperature as possible without taking too long. Half an hour in summer and a little longer in winter is about right.

Washing the butter is an important part of the process. I do not believe in much washing if the butter is for immediate use. One water will usually be sufficient. Too much cold water will destroy the fine flavor, because the flavoring oils are largely soluble in water. If the butter is to be kept for

some time, it is better to wash until the water comes away quite clear.

The temperature of the water used for washing has a great deal to do with the grain of the butter. If it is too cold the butter will come out too hard and dry, a very common fault in the winter time. If, on the other hand, the water is too warm, the butter will, of course, be soft and retain too much moisture. The proper temperature leaves the granules of butter in such a condition that they can be handled without gathering into a mass, and at the same time adhere readily when pressure is applied. The right temperature will vary considerable, according to circumstances. So much depends upon the natural consistency of the butter, that no rule can be applied other than the condition in which the butter is found after washing is finished. If the cows are on dry feed, the butter will be hard, owing to the large proportion of stearin present. Cottonseed meal has a tendency to make hard butter, while linseed meal has the opposite effect. Experiments have shown that the melting point of butter was on the average six degrees higher with a ration of cottonseed meal than it was when linseed meal was fed to the same cows. The temperature of the washing in such cases would have to be varied to about the same extent. Generally speaking, from fifty to fifty-five degrees will be about the right temperature, except in hot weather, when a lower temperature will be required to counteract the influence of warm air during working.

The salt should always be applied while the butter is in the granular state. The maker is enabled then to distribute it well throughout the mass, and that being done very little working is required.

I prefer salting in the churn, if one knows how much butter there should be in order to get at the proper amount of salt. I cannot understand why some makers will persist in pressing the butter into a mass before adding the salt, and even applying it during the process of working. When that is done the butter must be worked more than it should be to prevent

the mottled appearance, due to uneven distribution of salt. I need not impress upon any one the necessity for using the very best fine salt for buttermaking. That is well known. A fact perhaps not so well known is that salt will, if exposed to strong odors, absorb them to such an extent as to impart the same to the butter.

The butter should be worked at a temperature of about fifty to fifty-five degrees. If too cold the grain is injured by the heavy pressure required, and a certain amount of grinding which the butter will receive from the worker. The surfaces exposed to the rollers will be given a "lardy" appearance, which will show as the white thread-like streaks under the trier. When too warm the surplus moisture cannot be expelled without the butter.

If the salt has been well distributed while the butter was in the granular condition very little working will be required. I prefer to have it stand three or four hours after the salt has been applied before final working. If the temperature is right, I think a better texture or grain will be secured. Of course, I do not dispute that fancy butter can be made by finishing at once after removal from the churn, but I think more uniform results will be obtained the other way.

Now, in conclusion, I have only a few words to say regarding packages. One must be guided in the choice of package according to the market he is catering to. If for immediate consumption in local markets, there is nothing better than the standard square print.

We put up nearly all our butter at the dairy school in this way, and I want to describe our style of doing it. The butter is first wrapped in parchment paper, and then each pound is placed in a thick paper box, which folds tightly and almost completely excludes the air. The paper box prevents the parchment from drying and curling up, and is a help in preserving the butter. It is very convenient for the merchant, and has a dainty appearance. Both parchment and box have the name of the school printed thereon. When this butter is shipped to Montreal or other markets, it is packed in twenty

pound cases, which are made the exact size to hold that many prints. They are made of thin lumber, simply nailed together, and are not returned.

The total cost of parchment wrapper, paper box, and shipping case is less than one cent per pound. I am satisfied that we double the cost in extra price received for the butter, besides always finding a ready sale for all we make.

The square box is fast replacing the tub for packed butter. In fact, I may say, it has replaced it on our side of the line, where we began using it in 1892. The idea is to have a box that will hold fifty-six pounds, or half the English hundred weight. In order to do this it must measure one cubic foot inside. A solid cubic foot of butter weighs slightly more than fifty-six pounds, but butter is never packed perfectly solid, and something ought to be allowed for shrinkage. We always put fifty-seven pounds in each box.

The best shape for the box is square, only slightly larger at the top than at the bottom, in order that the butter may be turned out. The dove-tailed box is generally preferred to one that is nailed. Spruce is the favorite timber. White poplar is said to be suitable, but I have had no experience with it. No matter what kind of wood is used, it must be that grown on high land and thoroughly seasoned and kiln dried.

The inside of the box should be coated with paraffine wax. I would not use any other kind. If not waxed, the box must be soaked and scalded in the same way as the tubs are treated, and then they get out of shape. Of course, they are lined with parchment, but that does not take the place of "soaking" or other treatment of an unwaxed package, as many seem to suppose. It is merely an extra precaution. I believe the reason that we have been hearing so much about "mouldy butter" for some time past is because buttermakers have been depending entirely upon the parchment paper to protect the butter.

There certainly can be no foundation for the claim heard in some quarters that butter moulds more readily in boxes than it does in tubs made of the same wood and treated in the same

manner; the box is calculated to preserve the butter better than the tub.

Boxes should be filled full of butter cut off level with top, the parchment folded over, and the cover, which should rest on the butter, firmly nailed. When I say firmly, I do not mean that three-inch nails should be used, so that it will be necessary to break the cover to get it off. A thin nail with a large head should be used. A number of patent covers are on the market, and I think the best of these are likely to supersede the nailed cover.

THE DAIRY INDUSTRY.

C. H. WATERHOUSE, DURHAM.

Under the above title are included all persons who are marketing and handling either whole milk, butter, or cheese.

As a necessity milk is used by all classes of people, in all localities; therefore, information regarding it is important.

Dairying is carried on extensively in almost all the states, and is the chief product of many farms.

The number of cows is increasing, and ours is the leading dairy country in the world.

The value of butter consumed daily in the United States is estimated at one million dollars, and the consumption of milk is nearly the same.

It would be impossible to estimate the value of property represented in the dairy business, but there are about 18,000,000 cows, or one cow to every four inhabitants to be furnished with milk, butter, and cheese.

Although the largest dairy country in the world, it does not lead in the per capita consumption of dairy products, as Americans do not appreciate the food value of dairy products. In some of the older countries three times as much is consumed per capita as in the United States, but it is increasing annually in many places. Supposing each person to consume one hundred quarts annually, it would amount to a fair sized tumbler full daily.

More recently cream is being used more freely, one firm in Maine having sold $15,000 worth in the year 1896, to New England city dealers.

Condensed milk is also quite an industry in some localities. Milk is bought and sold both by weight and measure.

Although considered a liquid, the microscope shows it to contain globules of various sizes. All but the fats when dried are soluble in water.

There are about four and three fourths pounds of sugar in one hundred pounds of milk. This is used extensively in food preparations. It resembles powdered sugar, but is not so sweet. It is this which undergoes the greatest change when milk becomes sour. Rennet causes the casein of milk to coagulate and form curd, the chief ingredient of cheese. Fibrin retards the rising of cream. It may be best represented by comparing it to a cobweb.

Fibrin prevents the rising of cream to the surface of milk in which the sugar has commenced to change to lactic acid. This is why milk sends up the cream quicker in the "Cooley" can than in flat, shallow pans.

Milk globules are so small that a single drop contains millions of them. It would take years to count the globules in a quart. These globules vary in size in different breeds, being comparatively larger in the butter breeds. That containing the small globules is preferable for the market, as there is less liability to churning in transit.

One hundred pounds of milk contain 87 pounds of water, 4.8 pounds sugar, 3.5 pounds casein, and .7 pounds of mineral matter.

The fat varies more than any other part of the milk, running as low as two per cent and as high as seven per cent. The larger the proportion of fat the richer the milk. Most states have legal standards for milk solids; milk falling below such standards is considered adulterated, although it may be the pure product.

The standard, or law, requires three and one half per cent fat, nine to nine and one half solids, not fat. The total solids

vary from twelve to thirteen per cent. Some states have twelve per cent solids. In Massachusetts thirteen per cent is the standard. I remarked that people considered that the value of milk depends upon the amount of fat it contains; this is an error, as the casein is of value as food.

Variation in fat contents occurs from day to day, a variation of one per cent in the same cow. As the period of lactation progresses, there is a tendency to increase the solids, especially fat. Thus farmers are led to believe that a farrow cow's milk would increase in amount of fat. Such is not the case. To determine the value of a cow's milk for butter, the cow should be milked five months, and then make six tests six days and average them with a Babcock tester. Some say milk two months, make three tests, then eight months and make three tests; average the six tests. But I do not think this would be quite as well as the test after five months or one half the milking period, for the reason that the first test would have more milk.

It is a notion that feed given a cow influences the quality of her milk more than anything else. If a cow in normal condition gives rich milk at one period, her milk will be of good quality as a rule, subject to unaccountable variations. Feed has a much greater influence upon quantity than the fat. The per cent of fat in milk from any cow varies from day to day, feed and treatment being always alike. The causes are not always known; in fact such variations in fat seem to increase and decrease without any cause. If any milk is not cleanly or is in any way adulterated in solids, not fat, the fault is not with the cow. The changes are greater in fat than solids.

Buyers of milk should remember that, at highest prices, milk is as cheap an article of food as can be bought. Two quarts of skimmed milk and some corn bread is a very nearly balanced ration for a person, and has more nourishment than a pound of sirloin steak or a quart of oysters, at cost of twenty cents for beef, forty cents for oysters, with six cents for milk and meal.

It should also be remembered that milk is not always contaminated while with milkmen. Too often the milkman is blamed for impure milk when the blame rests with consumers. How often milk is left in refrigerators with onions, tomatoes, and other things that will quickly spoil the flavor! Pure as milk may be in its natural state, there are changes unavoidable. Thunder storms, some claim, have a tendency to sour milk. Any milk having a large amount of sediment should be looked upon as adulterated. Odors and peculiar flavors are due to foods, onions, turnips, etc.

Various chemicals are added as a preservative to keep from souring. The weight of opinion is against this. Milk should be kept in earthen or glass vessels. Old rusty tin is poisonous. Cold and heat are the best agencies for preserving milk. There should be no trouble in keeping milk sweet thirty-six hours after it reaches the customers, if the milk is cooled to forty-five degrees Fahrenheit as soon as drawn from the cows. Customers must keep it cool. Pasteurizing is now being extensively practiced. Heat and cold are the best preservative.

Pasteurizing means heating the milk to one hundred sixty degrees Fahrenheit. This temperature kills all germs of ferment, but does not kill contagious germs. Germs of decay having been killed, the milk immediately cooled to forty-five degrees will keep for forty-eight hours. Sterilizing milk will kill contagious germs, and is practiced when it is known that contagious diseases are prevalent. Sterilizing has a tendency to give a cooked taste, but the taste soon becomes agreeable. The sugar becomes scorched and gives this flavor.

The time is not far distant when milk that is taken to creameries will be sterilized with the exhaust steam to kill tuberculosis germs. The separator has a tendency to throw out germs into the slime gathered in the bowl and into skimmed milk. Few germs go into the cream. So I think sterilizing skimmed milk for calves will be more generally practiced later on.

For milk delivering, bottles are extensively used. Such bottles are helpful, the cream line is quickly observed, and sediment can be observed in bottom of the bottle. In the bottle is a neat, clean way to dispose of milk. Milk dispensed in cans are opened several times, as the man who delivers around town would take a quart from the can at a time. Dirt flying into the can carries injurious germs into the milk unobserved. Undoubtedly the best way to secure a good milk supply is to deal with a dairyman who is honest and scrupulously clean. His honesty and experience should be a sufficient guarantee as to good measure and quality and care. It is a mistake to consider milkmen a lot of tricksters. Honest men are in this business as well as any other. And one of the most important steps towards securing honest milk is to encourage the honest man by giving him trade. Laws are in force in some cities that are helpful, but there is incompetency in inspectors. One of the best incentives for a dairyman to keep his dairy as it should be, is to expect a visit at any time from his customers. Consumers should frequently visit the dairyman's premises, note cleanliness of surroundings, pure air, stables, and even the cows themselves,—sanitary conditions throughout. On a well conducted dairy farm one may expect to find these conditions perfect. A roomy, light, well-ventilated stable.

To produce good milk, and as a point of economy too, cows must be comfortable and well fed. Undue excitement affects the quality of the milk. Provide means for washing and sterilizing utensils, bottles, etc. Provision for aerating milk. Provide cold storage. The atmosphere should be pure when milking is done. It has been found that a greater amount of injurious bacteria will enter the milk pail at the udder region of cow. Milk when warmer than the atmosphere has a tendency to throw out impurities. Whitewash is a good disinfectant, land plaster, an absorbent. Having good clean bedding is a necessity.

Study to know your interests. Do not try to buy your milk where it is the cheapest unless you are able to distinguish

good and bad milk. One man cannot do this business much cheaper than his neighbor. Dairymen should bear in mind that milk is a food, and should not be left where he would not leave his own food. The too common practice of leaving milk to stand in the cow stable should be abandoned. To illustrate, take a quart can of pure cold water, suspend it in the stable the same length of time you allow the milk to remain in stable. Attempt to drink the water. This best illustrates the amount of impurities that enter into the milk that is allowed to remain in badly ventilated stables. I feel that I have not given the bottled system due credit. Milk, as soon as it is cooled, should be bottled and sealed. Each bottle is a measure. All the milk retailed should, whether from ten or twenty cows, be put into a tank to even up the quality; while one cow gives three per cent milk, another gives six per cent milk; bottle from the mixture. Eight and ten quart cans are used. Milk standing in cans one hour is better at the top than at the bottom.

Dairymen, have your trade mark. Every bottle should be labeled your firm name. This is a good way: "George Yeaton, Ayrshire Stock Farm Pure milk. Guaranteed four per cent fat. Veterinary certificate. Milked, February 10, 6 A. M." Seals unbroken.

Milk should be sold according to the fat contents. A three per cent milk should be sold for less price than six per cent milk. If skimmed milk is sold, the guarantee should be five hundredths of one per cent fat. No matter what the price, guarantee the goods and the price will regulate itself. It costs more to make rich milk than poor milk. It should be understood by consumers that the higher the per cent of fat the richer the milk. Large cities should be supplied in a different way from what is now done; milk companies could do this best. In the city of Rochester, I venture the assertion that six different men peddle milk on Charles street. If a corporation did the work, the peddlers would have a certain number of streets to dispense to. Those farmers now furnishing milk could net as much, for the work would be

done for less. Again, all peddlers have a certain amount of surplus milk. If the surplus of the twenty peddlers in Rochester could be put together butter could be made. Again, milk should be run through separators before delivery. Contractors take what they want at straight price. Surplus is turned over to creamery in city of Boston. Get the best man in the county to run the creamery business. Each producer invests one dollar per can and gets six per cent interest; 30,000 cans of milk a day goes into Boston; $30,000 will equip a plant, and the butter can be made and marketed for the skimmed milk. Four pounds butter in one hundred pounds milk, at two and one half cents a pound to make the butter, equals ten cents. Skimmed milk in Boston is worth fifteen cents to manufacture. So you see one could get good pay to manufacture the butter for the skimmed milk. That would even up the quality. Surplus is the cause of complaint among producers of milk for Boston market.

Now, how can that be remedied? It is impossible to retail milk without surplus; 3,000 to 5,000 cans of 8½ quarts each daily, which must be sold for its butter value. When I began creamery buttermaking, farmers valued milk at 5 cents a quart. Producers think now that milk is worth 20 cents a can for butter, with only ¾ of a pound of butter per can. Butter at 23 cents a pound, 2½ cents for making, reduces value to 20½ cents a pound, three fourths of which is 15.3 cents, skimmed milk 3 cents per can. Total value of can for butter is 18.3 cents. Producers should deliver milk to contractors in Boston.

For conclusion, I don't wish to be considered unique upon this topic; it is the old story repeated. Many of the things I have remarked I have learned by experience, and some by accident. The one principle must be adhered to in all the details of milk handling. School teachers taught the same old problems years and years ago,—two times two are four, and two times two will be four for generations to come. We must have the same kind of bacteria to make aromatic butter one hundred years from now unless the taste for sweet cream

butter predominates. There is an immense quantity of fresh butter used; we expect that the highest priced butter will be made from sweet cream.

STATE AID FOR THE DAIRY INDUSTRY.

MAJOR HENRY E. ALVORD, CHIEF OF THE DAIRY DIVISION, U. S. DEPT. OF AGRICULTURE.

All regular trade depends upon success in maintaining a satisfactory and uniform quality in the product concerned. This is especially true as regards the products of the dairy. If we want to retain a good customer, we know very well that we must attain a standard in milk, butter, or cheese, which satisfies him, and then hold to that standard, furnishing products varying very little in quality. And it is often necessary to keep up a uniform quantity of supply also.

These requirements, which are familiar enough in the small dealings from the farm, where producers and consumers are in direct communication, are equally applicable to larger business operations. They were largely the cause of successful substitution of co-operative dairying, or the creamery and factory system, for much of the private dairying of fifteen and twenty years ago.

Examples might easily be given in connection with concerns doing a large city milk business, syndicates, or combinations of cheese factories, and the development of extensive creamery plants.

The same principles hold true, and must be kept constantly in view, in any attempts to build up an export trade and find foreign markets for butter and cheese made in the United States.

Great Britain is at present the great butter buying country of the world, spending nearly eighty millions of dollars annually for butter made by people in other lands. By examining the British markets we find that large supplies of butter, with which our American article must compete if it goes there, come from Denmark and Sweden, from far distant Australia,

and from Canada. A noticeable feature in the butter reaching England from any one of these countries is the general uniformity in the quality of the article. Investigation shows that this is largely the result of direct efforts made through governmental agencies to promote the dairy industry. It is, therefore, well worth our attention to consider some of the methods pursued in these producing countries to increase the quantity of butter made, and to improve its quality.

Danish butter has a firm position at the top of the markets for salted butter in Great Britain. It will be the strongest competitor of creamery butter from the United States, while that is striving to get a foothold in the same markets. Yet this position of Danish butter is comparatively new, and it is interesting to note some of the agencies employed to obtain it.

The period of notable progress in Danish dairying begins with the year 1860. At that time the Royal Agricultural Society of Denmark employed Professor Segelcke to devote his entire time to the application of science to dairy work. (This society was a volunteer organization, and began work in the interest of dairying a good many years earlier. As early as 1837 it provided for the practical instruction of dairymaids and continued labors in this line in later years.) Segelcke's work was directed largely, at first, to impressing upon dairymen the importance of an actual knowledge of facts and accuracy in all details, as a substitution for guesswork. For example, he insisted upon the use of scales and thermometers. He also established dairy shows, educational in character. Young men were taken as pupils and trained until they could fairly be called dairy experts, and were then sent out to be employed by different local societies to advance the dairying of the neighborhood. In 1874, Segelcke was appointed to the full professorship of dairying then established in the Royal Agricultural College. About this time Professor Fjord was also employed, and gave his particular attention to the question of mechanics in connection with dairying and also to the use of ice. In 1876, the government made grants of money to assist Fjord's experiments in ice houses and in

the general use of ice in dairy work. In 1878, centrifugal cream separators appeared, and the government made grants to enable Professor Fjord to carefully experiment with these new machines. From this time the dairy work, patronized by the government, was extended over a very wide field, with liberal expenditure.

The first notable fruits of this policy appeared in 1879, at the international exhibition held in London that year; the first prize for salt butter, open to all the world, was won by Denmark, and this gave great impetus to the trade in Danish butter, not only in Great Britain, but in other countries foreign to Denmark.

The Danish government established butter contests in 1889, which have been continued to the present time. For this purpose a special building was erected, costing about $6,000, and the expense of conducting these contests has been from six to seven thousand dollars annually. As these shows are believed to have had much to do with improving the average quality of Danish butter, some details regarding them are worthy of attention.

A continuous butter show is held during several months of each year in the special building mentioned, where an even temperature can be maintained at all seasons. Dairymen and creamerymen, desiring to take part in these shows, pledge themselves in advance to send in a ready-made cask of butter whenever called for, and to repeat this at least twice a month, if required, during the contest. The butter thus sent must be from the last lot made by the sender for his regular trade, and in no way specially prepared for the contest. Every provision is made to thus secure samples of the ordinary, every-day product of the contestants. The director of these state shows has the right of utilizing government telegraph service, and is in possession of information which enables him to know exactly when and through what channel the butter leaves every factory or dairy. He telegraphs a factory to forward a package of butter for show, in such a way as to allow just time enough for the factory manager to select a cask from

the day's manufacture, and get it on board train or steamer in time to reach the show for judging. These sample packages are called for about once every two weeks during the show. They are examined and judged as soon as received, and again fourteen days later. Every package is weighed as soon as received, then the hoops at one end are removed, and the butter turned out and weighed by itself. It is then returned to the cask, and this is inverted on a funnel-shaped stand, made of tin, in the base of which is a receiving vessel, locked, containing a glass into which passes the brine, which gradually drips through the loosened staves. At the end of a fortnight, the weights are again taken, as well as the moisture left in the butter, and its color, character, aroma, and other qualities are carefully determined by the experienced persons on the staff of the director of the exhibit. The butter being entirely under the control of this staff for two weeks, there is ample time to reach accurate conclusions. Whenever these examinations discover butter which is inferior because of poor or tainted milk, carelessness in manufacture, or other causes, the factory manager or responsible dairyman is informed, and usually a member of the staff visits the place of manufacture to investigate the cause, and give proper instruction to avoid a repetition of the error. When these shows or contests began, about three hundred dairies and factories competed. In late years the number of entries is more than twice as many, and the average quality of the butter exhibited is very much improved. The advantages of the cooperative or factory system of buttermaking have been well demonstrated by these contests, resulting in the establishment of more than one thousand creameries within the last ten years.

The territory of Denmark is divided into four districts, and the government supports an official in each, who may be termed a dairy expert or adviser. This officer travels among the private dealers and butter factories, and inspects, advises, criticises, instructs, and practically supervises the work. Besides the district experts, there are several government

veterinarians and a mechanical engineer whose salaries are paid, and whose services can be obtained by any factory or dairyman calling for them, upon the payment of the necessary incidental expenses. To this direct aid in connection with buttermaking, the government adds much general work for the promotion of the export trade. Lines of refrigerator cars have been established, and the cars thus built are maintained in order to furnish satisfactory transportation from the producing districts to the points of export. Cold storage warehouses have been provided at the terminals and commercial refrigerators upon the export steamers. New harbors have been developed, and these with their approaches have been kept free from obstruction by government ice boats. All this has been done for the purpose of insuring quick service and regular lines of export for butter and other perishable products of Danish farms.

The statistics of the exports of Danish butter show the growth in this trade which has resulted from the fostering care of the government. Thirty years ago the average amount of the net export was 88,000 cwt., or something over 4,400 tons. This had risen to 220,000 cwt. in 1880, and in 1896 it was 887,000 cwt., or 44,350 tons. There has thus been a ten-fold increase in thirty years.

Net exports are stated because Denmark imports butter largely, partly for consumption and partly to export again. Thus for the last three years reported (ending September 30) the total exports of butter from Denmark and the quantity sent to Great Britain have been as follows:

Year.	Total cwts.	Cwts. to Great Britain.
1894,	1,145,000,	1,114,000.
1895,	1,157,000,	1,132,000.
1896,	1,223,000,	1,189,000.

About half of the butter exported is sent from Copenhagen. Other ports in the order of their importance are: Esbjerg, Odense, Aarhuus, Randers, and there are eight others.

The laws of Denmark, relating to the manufacture and sale of oleomargarine and other butter substitutes, and to the

adulteration of butter in any way, are very severe and well executed. The use of preservatives of all kinds for dairy products, except common salt, is absolutely prohibited. The supervision which the government exercises at home as to manufacture and export of butter is continued in connection with its transportation, and agents are maintained in England, so that all British buyers of Danish butter have a reliable guarantee as to its purity and high quality. The effect of this is to give Danish butter the position already stated, and considering all this care, it is not to be wondered at that the Danes maintain the lead in the butter markets of England.

The butter of Sweden is regarded as about equal to that of Denmark. The Danes admit this, and Swedish butter is said to be largely sold as Danish butter in England, whether or not it passes through Denmark *en route*. A good deal of it does so, and is included in the butter imported by Denmark for the purpose of exporting again, simply as a matter of business.

A good deal of butter passes directly from Sweden to England, the quantity being sufficient to justify the Swedish government in maintaining a dairy agent at Manchester.

Recent reports of the foreign butter business done by Sweden follow:

Year.	Total exports butter in cwts.	Cwts. to England.
1892,	336,000.	229,000.
1894,	438,000.	266,000.
1896,	487,000,	324,000.

Butter shows and competition are conducted in Sweden much like those in Denmark, are supported and supervised by the government with the same object of insuring better quality and greater uniformity in product.

There are thirty-three schools for dairy instruction in Sweden. One of these has for its special work the training of men as "consulents." These may be called dairy experts, although this translation is not exact or altogether explanatory. Every county in Sweden is provided with a dairy consulent, just as every county in France is furnished by the

government with an agricultural teacher and adviser. The dairy farmers of Sweden thus have, practically speaking, free advice from specially qualified men, supplied at their very door.

Most of the cheese of Sweden is consumed at home, only a few thousand hundred weight being exported.

Australia next deserves consideration. The dairy industry of this country is of very recent growth, and has been mainly confined thus far to New South Wales, Victoria, and New Zealand. Butter is the chief dairy export, although some surplus cheese is produced. The factory system has been generally adopted, and in 1897 there were over seven hundred manufacturing establishments in operation, besides numerous skimming stations. The central plants are called butter factories and the skimming stations creameries. Winter dairying is not largely practiced as yet, most of the butter being made from grass. The result is that the exports are made almost wholly between the first of September and the first of April. Nearly all the butter exported from Australia comes to England, and the season for this supply in London is from October to May. Even during this season, the arrivals of butter in England are very irregular. This is due largely to the long ocean journey. Although the steamers start weekly, difference in delays incident to the passage result in two or three arriving so as to put their cargo into London the same week. Then there will be a week or two without arrivals. This naturally causes disturbance in the regularity of the London trade in Australian butter. All butter leaving Australia is inspected and graded at the point of export. Three grades are made. That which passes the required standard is given the government brand or endorsement. The medium grade is allowed to pass out unmarked; the government allows it to go to market on its merits, but declines to give it the endorsement of an official brand. All which falls below a fixed minimum in quality is not allowed to pass as butter, but is branded "pastry" or "grease." In this way, the government guards the reputation of the butter

from that country. When poor butter is offered for export, the factory from which it comes is at once listed, and as soon as possible it is visited by a government dairy expert, who investigates the cause of the product being poor, criticises the prevailing conditions, and teaches better methods. This arrangement constitutes a cheap and most effective method of supervision. No time is wasted upon factories already doing satisfactory work, but all the labor and expense is put where it will do the most good. Thus the dairy doctors are only sent to visit those who are sick. The result of this work has been a rapid improvement in the average quality of Australian butter as shown by the record of the inspections. The production of butter branded has steadily increased,—the percentages reported for the last three seasons have been seventy-nine, eighty-eight, and eighty-nine. For the same three seasons, the medium grade, which is not branded, constituted twenty per cent, twelve per cent, and rather less than eleven per cent of the total offerings for export. The "pastry" butter, which constituted more than one per cent of all three years ago, has almost entirely disappeared.

Pasteurizing cream and milk has been favored in the interest of greater uniformity and better keeping quality in the butter, and has been adopted by a good many factories. Experiments by government experts, however, indicate that pasteurizing may not be beneficial during some parts of the year. To guard against the time necessary for the long voyage to market and the danger of deterioration during this interval, preservatives are freely used by the Australian buttermakers. These consist mostly of different forms of borax. It is well understood in the London market that all Australian butter is more or less borated. The packages in general use are rectangular in shape, and most of them are cubical boxes made of white pine, weighing when empty about twelve pounds, measuring exactly a cubic foot inside, and holding fifty-six or fifty-seven pounds of butter, which is half an English hundred weight, and a favorite size of package in British markets. The boxes all have a double lining of exceptionally heavy parchment paper.

Considering the disadvantages under which Australian buttermakers and exporters labor, it does not seem as if it were possible for the butter from that source to be a successful rival of butter from the United States, which can be placed on the English markets within two weeks from the time it is made, instead of two months. Yet the care which is being exercised in manufacture, and the close supervision of the Australian government, is resulting in a product of uniform excellence, and with the aid of preservatives, this butter reaches England in very good condition.

We will now turn to the Dominion of Canada, and the work which has been done by the government to promote the dairy industry there. Thus far the growth of cheesemaking has been more notable than that of butter, and the special reputation of the Canadian dairy rests upon the high standard of its cheese. Prior to 1865, cheese exported by the United States led the British market in both quantity and quality. Moreover, the trade relations between the United States and Canada were then such that we sold from half a million to two million pounds of cheese annually to Canada for their own use. But immediately after the termination of the reciprocity treaty with Canada, that country began to make its own cheese, and under the fostering care of the government a surplus was soon produced, and British markets were sought for Canadian cheese. Canada did not make use of the cheese factory system until eighteen or twenty years after its adoption in the United States. But under the stimulus given and helped by government grants, the growth has been very rapid. The number of cheese factories and creameries in Canadian provinces now exceed some of the leading dairy states.

Quebec is not the foremost dairy province of Canada, but may be cited as an example. In 1881, there were 167 creameries and cheese factories in operation in thirty-three counties of that province. In 1891, there were 728 in fifty-five different counties. The last reports show 335 creameries, 1,266 cheese factories, and 184 factories for both butter and

cheese, making a total of 1,785, or more than all New England and New York combined. During the same period the annual output of butter and cheese in the province of Quebec has increased 824 per cent.

A system has been adopted in Quebec, as well as in other provinces, under which fifteen to thirty factories are grouped together in what is called a syndicate. The government grants to each syndicate $250 per year towards the expense of maintaining expert inspection and instruction for the factories, the latter contributing whatever additional sum is necessary for this purpose. During the past six years, there has been an average of twenty-four such syndicates aided, each of these including thirty-two creameries and cheese factories on an average. The yearly visits of inspectors and instructors have averaged over 4,700, or a total of 30,000 for the six years. This means about ten visits per annum to every factory, amounting to practically a monthly official visit.

As before stated, Canada was making practically no cheese in 1865. In 1871, the cheese product was reported at 23,000,000 pounds. This increased to 61,000,000 pounds in 1881, and 160,000,000 pounds in 1891. Quality has accompanied quantity, and exports have kept pace with production.

Prior to 1871, Canada never exported over 3,000,000 pounds of cheese in a year, but the quantity rose to 20,000,000 pounds within the next five years, and reached 50,000,000 pounds in 1881. Ten years later, the amount had doubled again, and since 1890, from 130,000,000 to 155,000,000 pounds have been annually exported. Nearly all of this has gone to Great Britain, and the most discouraging feature of the matter is that the cheese exports of the United States to the same markets have been decreasing, in about the same proportion, during these same years. Canada now sends more cheese to England every year than the United States ever did,—that valuable market having been won directly away from us. (The causes of this unfortunate change are discussed in the report of the secretary of agriculture for 1895, and in the year book for 1895, pages 462-464.)

In the year 1890, the Dominion government appointed Prof. James W. Robertson as dairy commissioner. (This official's duties have since been materially enlarged, and his present title is commissioner of agriculture and dairying.) Commissioner Robertson is an exceptionally capable official, and with an able corps of assistants, he has accomplished a great work for the dairy interests of Canada. This work has been broad enough to cover all phases of the industry. Advice has been given as to the equipment and management of farms, and much has been done to improve dairy stock. Provincial and local dairy associations have been assisted, and practical teaching has been done, not only at the meetings of these organizations, but at many other neighborhood meetings, as well as at creameries and cheese factories. Great popular interest has been aroused in the advancement of dairying, and even the clergy have been induced to take part. Syndicates for instruction and improvement like those described in Quebec have been formed in the other provinces, their general object being to "develop the best methods of producing milk and cream and its products." The farm dairies, creameries, and factories have been inspected and criticised, and instruction given in regard to improvements. Every effort has been made to secure uniformity in methods of manufacture, and consequent uniformity of product. At the same time, the tendency of all this work has been to steadily improve the average quality of Canadian cheese. The foregoing remarks as to Canada relate particularly to the development of cheesemaking. This branch of dairying having been well advanced, the reputation of Canadian cheese firmly established, and the best of the English trade being secured, Canada is now turning its attention to butter. The interesting question rises, Shall we in the United States allow ourselves to be beaten in this line also, as we have been with Canadian cheese? There is certainly danger of such a result, unless we exert ourselves, and show as progressive a spirit as that exhibited in Canada.

The attention given by Canadian officials to buttermaking

is extended to every detail of the business, and includes special assistance in marketing the product. As done in Denmark, much stress is laid upon the use of ice in connection with buttermaking, and proper refrigeration during storage and transportation on the way to the foreign market. The government offers a bonus of one hundred dollars to every creamery which will provide itself with insulated refrigerating rooms conforming to plans furnished, and maintain these under the approval of the government inspector during a period of three years. Fifty dollars is paid the first year, twenty-five dollars the second year, and twenty-five dollars the third year, if the work is approved. Local refrigerators are built by the government as receiving stations, offering a temporary cold storage. Lines of refrigerator cars have been established under government supervision, and to some extent through government aid, running from the principal producing sections, the local stations, and all large creameries, directly to Montreal, the chief place for export. Cold storage is provided at Montreal, and arrangements made for its prompt and efficient use with any export butter which may be delayed at that point. The government has contracted with seventeen different steamers sailing from Montreal to equip themselves with refrigerator compartments for the transportation of dairy products at fixed low temperatures. The system of refrigeration is mechanical, securing the best insulated compartments, and duplex machinery is provided in all cases, so that accidents are next to impossible. In this way, refrigerators are provided on board steamers, which furnish from Montreal weekly service to London, Liverpool, and Bristol, and fortnightly service to Glasgow. Similarly, fortnightly service is provided from St. John's and Halifax to London, and monthly service from Prince Edward Island. The government pays a certain part of the initial cost of this equipment of the vessels, and in return is allowed certain control over the space and the rates of freight. The charges for cold storage are not permitted to exceed ten shillings per ton more than the current rate for first-class freight without refrigera-

tion. This makes the cost of these special export facilities only one tenth of one cent per pound for butter and cheese. The whole freight charge on dairy products from Montreal to London and Liverpool, with the best accommodations, has been, during the season of 1897, less than one half a cent a pound, and this is mainly due to the exertions and direct aid of the Canadian government. From New York and Boston during the same season, similar service has cost two or three times as much. And, indeed, some United States butter has been sent from New York city to be exported via Montreal, as being a cheaper route, as well as cooler. These general provisions for the refrigeration of dairies and dairy products are under the supervision of two government inspectors, one of whom gives his attention to the producing field and transportation to Montreal, and the other to all matters connected with exports.

The government goes still farther, and even offers to promote the introduction of dairying in the northwest territories by furnishing money to build creameries, by contracting to make and sell butter for four cents per pound, and by actually advancing ten cents per pound on the butter to farmers at the time they furnish the cream, in order to induce them to go into the business.

Everything is thus being done to the end that the quality of Canadian butter shall be of the best, and that it shall reach the foreign market in as nearly a perfect condition as possible. This work is bearing fruit. Canadian butter is rapidly increasing in quantity and improving in quality, so that it is now well classed in London. Canadian butter exports amounted to 2,225,000 pounds in 1894, worth about $400,000. In 1896, the quantity was 10,000,000 pounds, worth nearly $2,000,000, or more than the butter exports of the United States.

In 1897, so far as exports to Great Britain were concerned, the United States was ahead of Canada in the quantity of butter sent, and quite equal to it in quality. Yet Canada and the United States each contribute, as yet, only one per cent of

the butter which Great Britain buys. Therefore, we of the States have at the present time an even chance in this race to provide the British market with good butter.

Commissioner Robertson has during the past year visited Great Britain, and has left two special agents there who are to look after the introduction of Canadian products. They are to attend to arrivals, in proper handling, and forwarding to the best markets. They will watch the markets closely, study the wants of consumers as to styles, etc., and send home reports to guide in the preparation of products. They are to inform British Boards of Trade and Produce Exchanges as to how Canadian products can be obtained, their character, quality, etc. They are to canvass for sales among merchants and supply sample packages. In short, these special officials act as traveling salesmen and advisers, and are to push Canadian products in British markets in every possible way.

It is plain enough that the United States must do something of the same kind, or take action which will produce the same result, or else lose the race.

It is very plain to me, that we cannot be very hopeful about successfully competing in foreign dairy markets, with the countries whose work has been described, unless we take similar measures to raise the average quality of our butter and cheese and secure greater uniformity in these products.

But we cannot expect the government of the United States to do as Denmark, Sweden, Australia, and Canada have done, and are doing, in the matter of direct instruction and supervision in dairying. Our government differs radically from those of the countries named, and while we seem to be going pretty far in some things, in the way of paternalism, it is not likely we shall ever go as far as they do in the actual control of dairying or any branch of industry.

As Secretary Wilson so well expresses it, the government of the United States only tries to help the individual and the state, through the department of agriculture and otherwise, "where its arm is longer than theirs and its facilities greater." ("It is opening up new markets, introducing new plants, and

gathering facts for home producers, to the end that they may be better informed regarding their own work, and the operations of those the world over with whom they have to compete.")

One helpful thing the Federal government may well do. There seems to be no reason why the same general authority and machinery which now inspects animals and meats, which are to be exported from this country, and places upon them the guarantee of the United States that they are pure and genuine, should not be extended to cover butter and cheese. This would go far towards maintaining the standing of our dairy products in foreign markets. If a trade in pure butter or cheese is built under existing conditions, it may at any time be ruined through the shipment by unscrupulous persons, of low grade or adulterated products, or those which have been preserved with agents generally considered harmful. A government inspection and certification of products, which would grade above a certain fixed standard, would be highly beneficial.

It is, however, entirely within the province of the several states of the Union to do much work to promote the dairy industry on lines like those described as in operation in other countries. A few states where dairying is of especial importance have already taken action by legislation and otherwise which to some extent covers the ground indicated. Wisconsin has done something in the way of employing cheese instructors. In Iowa and Minnesota, the state dairy commissioners and their deputies inspect creameries, and give more or less assistance to the business of buttermaking. New York regularly employs three cheese instructors, who pass from factory to factory, criticising the work done and teaching the newest and most improved methods. All these state efforts have had good effect, and demonstrate what might be accomplished by more work of the same kind.

In any state it is simply a question whether the dairy interest is of sufficient general importance to justify public expenditure for its advancement.

My purpose has been to call attention to the advantages which dairying has derived in other countries from aid given by the state, and to suggest, thereby, the possibility and perhaps the expediency of similar public assistance, to a greater or less degree, by some of the states of this Union, and in at least one particular by the government of the United States.

EXHIBIT OF DAIRY PRODUCTS—AWARDS.

Never was the exhibit so large or scored so many points as on this occasion. The exhibit was in charge of W. D. Baker, the scorer being J. H. White of Boston. The following is a summary of the tests with the prize winners:

CLASS A—DAIRY TUB.

D. H. Foster, Lebanon.....Score, 96½
H. B. Hough & Son, Lebanon..... " 96

CLASS B—DAIRY TUB.

F. R. Sanders, Laconia.....Score, 97½
John W. Nye, Keene..... " 97¼
S. T. Noyes, Colebrook..... " 97

CLASS C—DAIRY PRINT.

G. M. Putnam, Contoocook.....Score, 98½
Monadnock Farms, Dublin..... " 97¾
J. M. Hiland, Hopkinton..... " 97½

CREAMERY.

CLASS D—TUBS. (Separator.)

Guernsey Dairy Creamery, Contoocook.....Score, 99
Hillside Creamery, Cornish..... " 97¾
Sanborn's Creamery, Deerfield..... " 97½

CLASS E—TUBS. (Gathered Cream.)

Lovell Lake Creamery, Sanbornville.....Score, 97
Peterborough Creamery, Peterborough..... " 95½
Keene Creamery..... " 95

CLASS F—PRINTS.

Cornish Creamery, Cornish Flats.....Score, 97½
Suncook Valley Creamery, Suncook..... " 96¾
Gilmanton Creamery, Gilmanton..... " 96½

CLASS H—SWEEPSTAKES.

Guernsey Dairy Creamery, Contoocook.....Score, 99

HONORABLE MENTION.

H. Richardson & Son, Littleton.....Score, 98¼
Lyme Creamery, Lyme..... " 98

CLASS G—GRANULAR BUTTER.

H. C. Smith, Holderness, first.
J. M. Pulsifer, Campton, second.
W. C. Pulsifer, Campton, third.

CHEESE—PLAIN.

A. L. Merrill, Quincy, first.
J. W. Pulsifer, Holderness, second.
J. M. Pulsifer, Campton, third.

CHEESE—SAGE.

D. B. Pulsifer, Campton, first.
W. C. Pulsifer, Campton, second.
H. C. Smith, Holderness, third.

Total number of entries, butter and cheese.....118
Highest score..... 99
Lowest score..... 90½
Average score..... 96.66

WORCESTER SALT PRIZES.

Creamery, first—Guernsey Dairy Creamery, Contoocook, Score, 99

PRO RATA PRIZES—$15.00.

Divided among those scoring next to the prize takers and scoring 95 or above:

H. Richardson & Son	$2.25
Lyme Creamery	2.00
J. W. Sanders, Laconia	1.50
J. M. Connor, Hopkinton	1.25
H. C. Smith, Holderness	1.25
Baker's River Creamery	1.25
Mrs. G. H. Randall, Keene	1.00
J. M. Pulsifer, Campton	1.00
Wolfeborough Creamery	.75
D. B. Pulsifer, Campton	.75
Chester Creamery	.50
W. C. Pulsifer	.50
Bath Creamery	.50
H. A. Adams, Wilton	.50

The expert, J. H. White, of Boston, pronounced it the finest exhibit he ever scored, and the first time he ever scored 99.

The "Mirror and Farmer" also gave a year's subscription to all prize takers at the exhibit.

The special prizes offered by the Worcester Salt Company, two gold watches valued at $25 and $15 respectively, for the two best scores in both dairy and creamery exhibits, were awarded as follows:

Creamery, first, gold watch—E. W. Cowen, Guernsey Dairy Company.

Second, gold watch—J. H. Bickford, Hillside Creamery.

Dairy, first, gold watch—G. M. Putnam, Contoocook.

Second—H. Richardson & Son, Littleton.

REPORT

OF THE

CATTLE COMMISSIONERS.

1897 AND 1898.

BOARD OF CATTLE COMMISSIONERS.

Irving A. Watson, *President* . . .	Concord.
N. J. Bachelder, *Secretary* . . .	Concord.

ADVISORY BOARD.

STATE BOARD OF HEALTH.

George A. Ramsdell	Nashua.
Granville P. Conn	Concord.
Edwin G. Eastman	Exeter.
Irving A. Watson	Concord.
Robert Fletcher	Hanover.
Charles S. Collins	Nashua.

STATE BOARD OF AGRICULTURE.

George A. Ramsdell	Nashua.
Joseph B. Walker	Concord.
John D. Lyman	Exeter.
Willard Bill, Jr.	Westmoreland.
William H. Sisson	Cornish.
Edward E. Bishop	Bethlehem.
George H. Wadleigh	Tilton.
Charles B. Hoyt	Sandwich.
Herbert O. Hadley	Temple.
Joseph D. Roberts	Rollinsford.

EXECUTIVE COMMITTEE STATE GRANGE.

Nahum J. Bachelder	Concord.
James E. Shepard	New London.
John M. Carr	Wilmot.
Horace A. Hill	Derry.
Emri C. Hutchinson	Milford.

VETERINARIANS.

William T. Russell	Nashua.
Robert J. MacGuire	Concord.
George G. MacGregor	Whitefield.
A. L. Barrett	Peterborough.
Lemuel Pope, Jr.	Portsmouth.
A. L. Dodge	Manchester.
F. C. Wilkinson	Claremont.
T. Gordon Lillico	Dover.
Lynford E. Tuttle	Franklin.
George E. Copp	Tuftonborough.
George E. Wiggin	Wolfeborough.
Richard Ebbitt	Manchester.
J. M. Parker	Haverhill, Mass.

REPORT.

To His Excellency the Governor and to the Honorable Council:

The report of the State Board of Cattle Commissioners, from January 1, 1897, to January 1, 1899, is herewith submitted, together with suggestions upon the previous action of the board and recommendations for its future policy.

Preliminary to the report we publish the provisions of the Public Statutes governing the Board of Cattle Commissioners and amendments subsequently enacted.

CHAPTER 113, PUBLIC STATUTES.

UNITED STATES INSPECTORS.

SECTION 1. The governor is authorized to accept on behalf of the state the rules and regulations prepared by the commissioner of agriculture under and in pursuance of section three of an act of congress approved May 29, 1884, entitled "An act for the establishment of a bureau of animal industry, to prevent the exportation of diseased cattle, and to provide means for the suppression and extirpation of pleuro-pneumonia and other contagious diseases among domestic animals," and to co-operate with the authorities of the United States in the enforcement of the provisions of such act.

SECT. 2. The inspectors of the bureau of animal industry of the United States shall have the right of inspection, quarantine, and condemnation of animals affected with any contagious, infectious, or communicable disease, or suspected of being so affected, or that have been exposed to any such disease; and for these purposes are authorized and empowered to enter upon any ground or premises. They shall have power to call on sheriffs, constables, and peace officers to assist them in the discharge of their duties in carrying out the provisions of said act of congress; and it is made the duty

of said officers to assist them when so requested. The inspectors shall have the same powers and protection as peace officers while engaged in the discharge of their duties.

SECT. 3. All damages and expenses incurred under the preceding sections shall be paid by the United States, and in no case shall this state be liable for any part thereof.

STATE BOARD OF CATTLE COMMISSIONERS.

SECT. 4. The secretary of the state board of agriculture, the master of the New Hampshire state grange of the Patrons of Husbandry, and the secretary of the state board of health, for the time being, shall constitute a board, to be known as the state board of cattle commissioners. If a vacancy in the board shall occur, the governor, with the advice of the council, shall fill it by appointment, and the appointee shall hold office until the vacancy in the office occasioning the vacancy in the board is filled.

SECT. 5. The board shall make investigations in regard to the existence of contagious and infectious diseases among domestic animals within the state, and may make regulations prohibiting the introduction into the state of animals so diseased, and controlling or prohibiting their transportation, and such other regulations as the board deems necessary to exclude or arrest any such disease, and may modify or amend its regulations as the circumstances shall require.

SECT. 6. The board may employ skilled veterinarians and agents and servants to aid in the performance of the duties assigned to the board.

SECT. 7. Any person or corporation who shall violate any of the regulations of the board shall be fined not exceeding one hundred dollars.

SECT. 8. The compensation and expenses of the board shall be audited and fixed by the governor and council, and shall be paid from the state treasury, but all expenses incurred under the provisions of this chapter shall not exceed ten thousand dollars in any one year.

CARE AND DISPOSITION OF DISEASED ANIMALS.

SECT. 9. Selectmen shall cause all horses infected with glanders or other contagious disease, and all other domestic animals infected with contagious diseases, or which have been exposed to such diseases, to be collected in some suitable place or places and kept isolated from other animals so long as may be necessary to prevent the spread of the diseases.

SECT. 10. In the performance of the duties prescribed by the preceding section, the selectmen shall be governed by the regulations and directions that may be made or given on the subject by the state board of cattle commissioners.

SECT. 11. The state board of cattle commissioners, or, if they have not taken cognizance of the case, the selectmen of the town in which the animal is, may order any domestic animal to be killed and buried which, in the opinion of a veterinary surgeon selected by them, has a contagious or infectious disease.

SECT. 12. The owners of animals so killed shall be entitled to recover of the town the value of such animals in their diseased condition, if they had been owned in the state three months at least before the disease was detected. The state board of cattle commissioners or the selectmen, as the case may be, shall cause the value to be ascertained by the appraisal of three competent and disinterested persons selected by them, who shall be sworn to the faithful discharge of their duties.

SECT. 13. In case the owner is aggrieved by the appraisal, he may appeal by petition to the supreme court within thirty days after he is notified of the appraisal. He shall notify the town of his appeal, and enter and prosecute it as he would if it were a civil action at law wherein the same amount of damages was claimed, and judgment shall be rendered therein in like manner.

SECT. 14. If upon such appeal he recovers a larger sum than the appraisers awarded him, he shall recover his taxable costs; otherwise he shall pay costs.

SECT. 15. All damages and expenses incurred under the

six preceding sections, except expenses incurred by the state board of cattle commissioners, shall be paid by the town in the first instance; but four fifths thereof shall be re-imbursed to it from the state treasury. The governor and council shall audit all claims thus presented, and the governor shall draw his warrants upon the treasurer for the amounts allowed, in favor of the towns entitled thereto.

PRECEDENCE IN AUTHORITY.

SECT. 16. In cases where United States inspectors, state commissioners, and selectmen, or any two of such boards, take action with reference to the same subject matter under the provisions of this chapter, they shall have precedence in authority in the order above named.

PENALTIES IN CERTAIN CASES.

SECT. 17. Any person or corporation who shall bring into the state, between the twentieth day of May and the twentieth day of October, any Texas or Cherokee cattle that have not been kept north of the Ohio or Missouri river during the winter immediately preceding, shall be fined not exceeding twenty-five dollars for each animal so brought into the state. The term Texas or Cherokee cattle shall be construed to mean the native cattle of Texas and Louisiana and the classes of cattle known under those names.

SECT. 18. Any person who shall expose, or suffer to be exposed, in any highway, public place, or pasture, any horse affected by the disease known as glanders, shall be fined not exceeding fifty dollars for each offense, for the benefit of the town or city where the offense is committed.

SECT. 19. Any person exposing any domestic animal as aforesaid, affected with any other contagious or troublesome disease, shall be fined not exceeding twenty-five dollars for each offense, for the benefit of the town.

SECT. 20. It shall be the duty of selectmen and police officers of towns in which any of the offenses mentioned in the three preceding sections shall be committed, to cause the offenders to be prosecuted.

AMENDMENT OF 1893.

At the session of the legislature of 1893 the following amendment was passed :

SECTON 1. The owners of cattle killed by order of the state board of cattle commissioners shall recover of the state one half the value of such animals upon a basis of health, said value to be ascertained by a disinterested appraisal, provided they have been owned in the state three months at least before the disease was detected.

SECT. 2. All acts and parts of acts inconsistent with this act are hereby repealed, and this act shall take effect upon its passage.

QUARANTINE REGULATIONS.

The following order is still in force :

STATE OF NEW HAMPSHIRE.

BOARD OF CATTLE COMMISSIONERS.

CONCORD, July 14, 1896.

GENERAL ORDER No. 3.

1st. General Order dated January 11, 1892, and General Order dated January 19, 1892, are hereby repealed.

2nd. All persons and companies are hereby prohibited from bringing or driving neat cattle into the State of New Hampshire without a permit from this Board.

3rd. All neat cattle brought or driven into the State of New Hampshire under a permit from this Board, are hereby placed in quarantine upon arrival in the state until identified and released.

4th. Selectmen of towns and cities of New Hampshire are hereby authorized to seize and hold in quarantine any neat cattle coming into the state without a legal permit, and notify this Board at once of such action.

5th. Permits to bring or drive neat cattle into New Hampshire will be issued only upon the result of the tuberculin test, to be applied and reported under such regulations and forms as will be furnished upon application to this Board.

6th. This order is issued under authority of chapter 113 of the Public Statutes of New Hampshire, and all violations will be vigorously prosecuted.

7th. This order shall take effect on the fifteenth day of July, 1896.

IRVING A. WATSON, *President,*
N. J. BACHELDER, *Secretary,*
Board of Cattle Commissioners.

The following explanatory circular was issued in connection with the above order :

STATE OF NEW HAMPSHIRE.
BOARD OF CATTLE COMMISSIONERS.

CONCORD, July 14, 1896.

To Whom It May Concern :

The quarantine regulations issued by the Board of Cattle Commissioners of the State of New Hampshire against all cattle outside of the state are made necessary by the action already taken in the same line by the authorities of other New England states. Evidence has been submitted to this board that animals, failing to pass the test and therefore debarred from those states, are being brought into New Hampshire and are contributing to our milk supply, to the injury of the healthfulness and reputation of New Hampshire dairy products.

Persons desiring to bring cattle into New Hampshire will be furnished upon application with the necessary blanks upon which to forward the result of the test, said test to be made by any person who is satisfactory to the cattle commissioners of the state in which the test is made. Upon arrival in this state the cattle will be identified and released as soon as practicable by this board or its representative.

In making the report of the tuberculin test, when applying for a permit, both the original and duplicate reports are to be made out and forwarded to this office without being detached from the blank permit.

BOARD OF CATTLE COMMISSIONERS,
Concord, N. H.

MODIFICATION OF QUARANTINE ORDER.

STATE OF NEW HAMPSHIRE.
BOARD OF CATTLE COMMISSIONERS.
CONCORD, April 1, 1897.

GENERAL ORDER No. 4.

General Order No. 3, dated July 14, 1896, is hereby modified as follows :

On and after this date, unless otherwise ordered, neat stock will be admitted to the state of New Hampshire for pasturage or for domestic use under the following conditions :

1. Applications for permit to bring cattle into New Hampshire for pasturage or for domestic use must be made upon blanks furnished by this board.

2. The owner or drover of said cattle must state upon said application that they are brought into the state for pasturage, or for domestic use.

3. The owner or drover of said cattle must furnish upon said application the certificate of a veterinarian, who is a regular graduate of a veterinary institution, or who is recommended by the cattle commissioners of the state from which the cattle are sent, stating that the cattle have been subjected to a physical examination, and no symptoms of tuberculosis or other contagious disease are found.

4. Applications from Massachusetts must also state that the cattle have been tagged by the Massachusetts Cattle Commission, which will entitle them to return to that state without re-examination, and must be indorsed in this respect by the Massachusetts Cattle Commission, or an agent of said commission.

5. This order will take effect April 1, 1897, and remain in force until revoked by this board.

N. J. BACHELDER,
Secretary New Hampshire Board of Cattle Commissioners.

The following explanatory circular was issued in connection with the modification order :

STATE OF NEW HAMPSHIRE.

BOARD OF CATTLE COMMISSIONERS.

CONCORD, April 1, 1897.

To Owners and Drovers of Stock :

The inclosed order modifies the previously existing regulation in regard to bringing neat stock into New Hampshire for pasturage, inasmuch as it allows a physical examination instead of requiring the tuberculin test. The application for permit must be made to the board upon the application furnished by this board, and no neat cattle can be legally admitted for pasturage until said application has been properly filled out and filed with this board, and the permit issued in due and regular form. In short, this order simply allows the report of the physical examination to be filed with this board instead of the report of the tuberculin test, and a permit to bring cattle into New Hampshire for pasturage or other purposes is just as necessary as before the issuing of this order.

Selectmen and other officials have full authority to proceed against violators of this and the previous order as modified, the same as before, and all parties will govern themselves accordingly.

N. J. BACHELDER,

Secretary New Hampshire Board of Cattle Commissioners.

INSPECTION SERVICE.

While the law enacted to govern this matter confers upon the executive officer of the state board of health, the state board of agriculture, and state grange, the authority in the suppression of contagious diseases among domestic animals, yet all action taken and money expended has been with the approval of the several organizations named and by the advice of the governor and council. While every case coming to the attention of the board has been investigated and such action taken as the policy of the board demanded, the keeping of the

work within legitimate bounds has been somewhat complicated by the appropriation made by the legislature in 1895 of $100,000 for the prosecution of this work, vetoed by the governor. The present commission has never held that the exigencies of the case required the expenditure of any such amount of money, and subsequent events have proven this position to be sound. The present commission has never sought or desired the management of this matter, and favored the above bill after it was so restricted as to be under the entire control of the governor and council, and provided for the appointment of a commission to control and direct the matter. We make this somewhat extended reference to the action leading up to the period for which this report is made in order that we may more intelligently report the work accomplished and state our conclusions deduced therefrom.

The members of the commission have been allowed, by the governor and council, $500 annually for clerk hire, which, with the exception of printing and postage, has been the entire office expense in the administration of the law. All applications to the board for permits to admit cattle to the state have been complied with if the proper certificate of soundness was furnished, and several thousand animals have been annually admitted under this regulation. All applications to the board for inspection of herds within the state have been given attention by forwarding to the parties making application a blank form of which the following is a copy :

APPLICATION FOR CATTLE INSPECTION.

....., 1898.

To the Board of Cattle Commissioners,
State of New Hampshire,
Concord.

Gentlemen,—I hereby make application for an official inspection of my herd of cattle, in regard to which I make the following statement:

My entire herd consists of.....cattle.
First noticed symptoms of disease about.....
Symptoms noticed are.....
.....
These cattle are at my stable located about.....miles from .....the nearest railroad station.

If the board considers an investigation advisable, and upon a physical examination finds sufficient symptoms of tuberculosis in the herd to warrant, in the opinion of the board, the application of the tuberculin test to the herd, I hereby authorize its application by the board. I understand the expense of making an inspection to be entirely borne by the board, and that, according to law, I am to receive one half the health value of all animals condemned by the test and destroyed in the presence of myself, or that of my agent. I also agree to disinfect the stable, and take other precautionary measures in accordance with the instructions of the cattle commissioners.

(Signed)

.....
P. O. Address.....

This plan has been strictly adhered to except in an occasional case where arrangements had been previously made to inspect herds in the immediate vicinity of the person applying, and there was not time to have the blank forwarded and returned. The inspection would then be made without the formal application, as it required no extra expense. Other exceptions have been in the case of applications from boards of health, or in the suspected existence of glanders in horses, both of which have generally had prompt attention.

All applications for inspection in official form as indicated above have had careful consideration by the board, and if the conditions reported indicated the presence of any contagious disease an inspection was ordered as soon as practicable. It

has not been the practice of the board to make a second inspection in a town immediately after a previous visit, but to make the inspection as soon as the circumstances seemed to warrant, using discretion in the matter. In this work the most distant sections of the state have had equal attention with the central, and no inspection has been withheld on account of any extra expense in reaching the herd. The applications made to the board during 1897 which, upon consideration, were worthy of an investigation, and which are on file as the authority of the board for ordering investigations, are as follows:

OWNERS OF STABLES INSPECTED, 1897.

Jan.	3.	C. A. Eastman,	Concord
Jan.	5.	C. M. Morse,	Plymouth
Jan.	6.	A. J. Morse,	Mason
Jan.	6.	F. E. Tarbell,	Mason
Jan.	6.	M. H. Hodgman,	Mason
Jan.	6.	E. J. Hodgman,	Mason
Jan.	6.	C. H. Hodgman,	New Ipswich
Jan.	7.	George W. Sargent,	Henniker
Jan.	7.	J. W. Button,	Jefferson
Jan.	8.	I. B. Dodge,	Amherst
Jan.	8.	J. H. Lynch,	Wilton
Jan.	8.	M. E. Cobleigh,	Milford
Jan.	9.	W. L. Fuller,	Hudson
Jan.	9.	J. A. Sleeper,	Hollis
Jan.	11.	J. B. Walker,	Concord
Jan.	12.	D. K. Marsh,	Laconia
Jan.	16.	F. C. Moore,	Dublin
Jan.	19.	M. C. Brown,	Meredith
Jan.	19.	D. A. Ambrose,	Meredith
Jan.	19.	Hiram Bixby,	Meredith
Jan.	21.	Mrs. A. E. Thomas,	Whitefield
Jan.	22.	M. E. Wiggin,	Durham
Jan.	22.	George Welch,	Benton
Jan.	22.	George H. Clark,	Benton
Jan.	23.	Thomas Follansbee,	Peterborough
Jan.	25.	F. O. Gould,	Weare
Jan.	25.	W. Hadley,	Weare
Jan.	26.	Albert Michia,	Newport

Jan.	26.	Fred Jones, Wilton
Jan.	26.	S. A. Way, Lancaster
Jan.	27.	J. G. Carlton, Mont Vernon
Jan.	27.	H. F. Dodge, Mont Vernon
Jan.	28.	Charles H. Upham, Merrimack
Jan.	30.	S. Parkhurst, Bedford
Jan.	31.	Otis B. French, Stratham
Feb.	2.	George E. Green, Hinsdale
Feb.	2.	Ruth McCoy, Peterborough
Feb.	3.	E. E. Lake, Hampstead
Feb.	3.	C. B. Clark, Hampstead
Feb.	4.	H. F. Herrick, Merrimack
Feb.	5.	L. K. Hutchinson, Milford
Feb.	5.	W. C. Holmes, Jefferson
Feb.	5.	W. W. French, Northfield
Feb.	5.	George O. Pillsbury, Rumney
Feb.	6.	S. J. Clay, Bristol
Feb.	10.	J. E. Favor, Bennington
Feb.	16.	Mary C. Whitcomb, Hillsborough
Mar.	10.	T. L. Wadleigh, Meredith
Mar.	11.	C. S. Hall, Epsom
Mar.	13.	R. T. Connell, Hudson
Mar.	13.	J. A. Sanders, Hudson
Mar.	13.	C. C. Crane, Weare
Mar.	13.	Morton E. Simons, Weare
Mar.	15.	G. M. Hartshorn, Wilton
Mar.	15.	J. B. Bishop, Milford
Mar.	15.	D. W. Russell, Wilton
Mar.	15.	W. P. Curtis, Concord
Mar.	16.	Peter Record, New Ipswich
Mar.	16.	N. F. Nichols, Newton
Mar.	16.	F. W. Pritchard, New Ipswich
Mar.	16.	L. Brigham, Greenville
Mar.	17.	Amos Whipple, Newport
Mar.	17.	Dexter Parker, Newport
Mar.	17.	F. N. Parrow, Claremont
Mar.	17.	George Rowe, Lempster
Mar.	17.	Horace Walker, Barnstead
Mar.	18.	J. E. Gray, Jaffrey
Mar.	19.	E. M. Lyford, Canterbury
Mar.	26.	John A. Rogers, Jefferson
Mar.	31.	Charles Roy, Somersworth
Mar.	31.	C. H. Thomas, Brookfield
Mar.	31.	Frank Bartlett, Meredith

April 2.	Hope L. Lovell,	Walpole
April 2.	F. W. Fiske,	Chesterfield
April 3.	Mrs. S. J. Straw,	Epsom
April 7.	F. Keyes,	Portsmouth
April 8.	J. H. Jenkins,	Barnstead
April 9.	W. M. Flanders,	Warner
April 9.	Mrs. M. M. Howe,	Henniker
April 10.	A. A. Pressey,	Derry
April 10.	G. H. Hardy,	Londonderry
April 12.	George F. Hodgman,	Concord
April 14.	George Langdell,	New Boston
April 14.	David Marden,	New Boston
April 16.	D. G. Webster,	Wilmot
April 17.	John Elson,	Hooksett
April 17.	W. L. Cross,	Amherst
April 17.	J. G. Carlton,	Mont Vernon
April 17.	Charles Tarbell,	Milford
April 17.	W. E. Hill,	Amherst
April 19.	F. H. Sawtelle,	Nashua
April 19.	F. A. Woods,	Hollis
April 20.	C. H. Rockwood,	Temple
April 20.	Stanley H. Abbott,	Wilton
April 20.	John Varley,	Wilton
April 20.	Eden Putnam,	Wilton
April 20.	Mrs. George Small,	Wilton
April 20.	Herbert D. Haynes,	Deerfield
April 22.	A. L. Mason,	Wolfeborough
April 23.	Ira B. Small,	Jefferson
April 23.	Robert Hazeltine,	Chester
April 23.	William Johnson,	Chester
April 26.	F. C. Young,	Barrington
April 28.	A. L. Barker,	Windham
April 29.	J. W. Duneklee,	Francestown
April 29.	A. W. Avery,	Francestown
May 2.	Dunlap & Co.,	Nashua
May 3.	A. H. Carter,	Gorham
May 3.	Martha D. Abbott,	Wolfeborough
May 3.	Charles Sanders,	Derry
May 5.	C. Sullivan,	Portsmouth
May 6.	Stoker & Graham,	Ossipee
May 6.	Mark Batchelder,	Hudson
May 7.	E. H. Lord,	Wolfeborough
May 8.	F. A. Blanchard,	Greenfield
May 8.	William Wilson,	Greenfield

May 8.	Dexter Parker,	Newport
May 10.	Samuel G. Potter,	Concord
May 11.	Nellie F. Thomas,	Raymond
May 14.	Henry McCoy,	Washington
May 15.	J. C. Morrill,	Laconia
May 15.	Levi E. King,	Jefferson
May 17.	George H. Blood,	Hollis
May 18.	W. W. Goodale,	Amherst
May 18.	F. P. Durgin,	Greenland
May 19.	A. J. Williams,	Keene
May 19.	A. C. Wheeler,	New Ipswich
May 19.	John H. Whitney,	New Ipswich
May 19.	E. S. Kennedy,	Mason
May 19.	E. F. Blanchard,	New Ipswich
May 27.	W. H. Armstrong,	Windham
May 29.	James Parsons,	Rye
June 1.	J. S. Merrill,	Chichester
June 1.	W. D. Locke,	Concord
June 2.	Reuben A. Gerry,	Contoocook
June 3.	George S. Peavey,	Greenfield
June 3.	Abro Whipple,	Newport
June 3.	C. W. Sabine,	Lempster
June 4.	A. S. Ladd,	Laconia
June 5.	David J. Holmes,	Strafford
June 7.	Hannah C. Beck,	Greenland
June 8.	C. S. Campbell,	Bedford
June 10.	E. C. Mills,	Sandown
June 14.	N. L. Green,	Sharon
June 14.	Nelson Boxley,	Sharon
June 15.	John E. Griffin,	Hudson
June 15.	J. E. Nichols,	Hudson
June 15.	George W. McKenny,	Derry
June 15.	H. O. Hill,	Derry
June 17.	L. P. Lamprey,	Sandwich
June 18.	David Langway,	Jefferson
June 18.	Ira B. Hall,	Whitefield
June 18.	Frank Brown,	Lancaster
June 18.	William F. Goodwin,	Hooksett
June 21.	E. E. Hoyt,	Manchester
June 22.	Jerome Montgomery,	Hopkinton
June 24.	W. S. Thayer,	New Ipswich
June 24.	S. E. Stone,	New Ipswich
June 24.	S. W. Mansfield,	Greenville
June 25.	M. H. Fiske,	Temple

June 25.	C. S. Heald,	Wilton
June 25.	J. M. Barton,	Temple
June 25.	J. A. Boutelle,	Amherst
June 25.	W. P. Holt,	Lyndeborough
June 25.	Fred B. Wheeler,	Hollis
June 25.	Henry Kelso,	New Boston
June 26.	Isaac Matave,	Hampstead
June 26.	O. M. Tenney,	Chester
June 28.	R. A. Philbriek,	Weare
June 29.	S. O. Joy,	New Durham
July 1.	Hiram Clark,	Lisbon
July 1.	C. M. Morse,	Plymouth
July 5.	C. H. Wiggin,	Bedford
July 7.	Henry McKenzie,	Lempster
July 8.	F. P. Muzzy,	Bedford
July 8.	Nathaniel Brewster estate,	Wolfeborough
July 9.	John H. Clark,	Ossipee
July 10.	John P. Weeks,	Greenland
July 12.	C. H. Page,	Kingston
July 12.	W. P. Babb,	Epsom
July 12.	C. J. Shaw,	Chichester
July 15.	Thomas L. Smith,	Meredith
July 15.	M. C. Bailey,	Meredith
July 15.	E. J. Sleeper,	Holderness
July 19.	E. W. Silloway,	Kingston
July 20.	Leroy Stillings,	Jefferson
July 22.	D. H. Burns,	Londonderry
July 28.	John Dargis,	Franklin
July 28.	Emil Peekham,	Manchester
July 28.	P. O. Chapman,	Manchester
July 29.	Luke Bellville,	Newport
Aug. 2.	H. H. Putnam,	Merrimack
Aug. 6.	Henry Dowst,	Epsom
Aug. 6.	M. C. Paeker,	Greenland
Aug. 6.	George H. Berry,	Greenland
Aug. 8.	George G. Jennison,	Amherst
Aug. 13.	Bartlett Martin,	Pembroke
Aug. 14.	C. H. Crawford,	Jefferson
Aug. 18.	N. E. Martin,	Concord
Aug. 19.	H. A. Goodwin,	Hollis
Aug. 19.	A. F. Eastman,	Barnstead
Aug. 20.	A. S. Eaton,	Warner
Aug. 21.	J. F. Tenney,	Antrim
Aug. 24.	Baldwin estate,	Wilton

Aug. 26.	Winthrop Aldrich,	Effingham
Aug. 27.	A. D. Cram,	Lyndeborough
Sept. 2.	John Johnson,	Winchester
Sept. 4.	Elisha Plaisted,	Jefferson
Sept. 11.	W. C. Fletcher,	Nashua
Sept. 11.	J. A. Boutelle,	Amherst
Sept. 11.	T. M. Russ,	Salem
Sept. 13.	C. A. Eastman,	Concord
Sept. 15.	H. O. Wells,	Epsom
Sept. 15.	C. S. Seavey,	Epsom
Sept. 15.	A. S. Hall,	Epsom
Sept. 18.	E. B. Merrill,	Andover
Sept. 18.	M. A. Dalton,	Auburn
Sept. 21.	S. D. Johnson,	Goffstown
Sept. 22.	Irving Applebee,	Jefferson
Sept. 22.	Edson H. Patch,	Francestown
Sept. 23.	G. W. & E. E. Hurd,	Lempster
Sept. 23.	George W. Matthews,	Acworth
Sept. 25.	H. J. French,	East Kingston
Sept. 25.	C. F. Kimball,	Salem
Sept. 25.	John Crowell,	Salem
Sept. 29.	H. H. Parker,	Milford
Sept. 29.	T. C. Kittredge,	Merrimack
Sept. 29.	C. C. Keith,	Hollis
Sept. 30.	A. J. Morse,	Mason
Sept. 30.	Everett Bucume,	New Ipswich
Oct. 1.	Frank G. Cilley,	Weare
Oct. 2.	W. H. Kimball,	Salem
Oct. 2.	Mrs. M. E. Call,	Windham
Oct. 2.	William Hill,	Peterborough
Oct. 5.	W. T. Davis,	Effingham
Oct. 8.	J. A. Edgerly,	Tuftonborough
Oct. 23.	Edson T. Collins,	Danville
Oct. 25.	H. R. Priest,	Franconia
Oct. 25.	L. L. Fish,	Windham
Oct. 26.	J. R. Parks,	Lancaster
Oct. 27.	G. W. Crawford,	Jefferson
Oct. 29.	Zenas Dexter,	Whitefield
Nov. 4.	James M. Hook,	Hopkinton
Nov. 4.	George E. Clark,	Milford
Nov. 4.	George Kingsbury,	Francestown
Nov. 17.	Mary Williams,	Warner
Nov. 23.	A. B. Davidson,	Temple
Nov. 24.	H. S. Field,	Merrimack

Nov. 24.	H. E. Spaulding,	Hollis
Nov. 24.	A. A. Jenkins,	Merrimack
Nov. 24.	James F. French,	Canterbury
Nov. 26.	L. W. Fisher,	Merrimack
Nov. 26.	E. E. Hurd,	Lempster
Nov. 27.	Rufus Flanders,	New Hampton
Nov. 27.	Frye Brothers,	Wilton
Nov. 27.	C. P. Smith,	Jefferson
Nov. 27.	K. H. Abbott,	Wilton
Nov. 27.	O. M. Bray,	Whitefield
Nov. 27.	F. P. Stillings,	Jefferson
Nov. 29.	S. H. Dunbar,	Wilton
Nov. 29.	J. F. Savage,	Wilton
Nov. 30.	P. P. Mitchell,	Nashua
Nov. 30.	E. H. Nutting,	Francestown
Dec. 6.	W. H. Kimball,	Salem
Dec. 6.	F. W. Emerson,	Salem
Dec. 8.	W. W. Livermore,	Grafton
Dec. 8.	W. B. Reynolds,	Hudson
Dec. 10.	Jerry Graney,	Hinsdale
Dec. 10.	John Quimby,	Durham
Dec. 16.	J. Gove,	Henniker
Dec. 18.	L. K. Phipps,	Milan
Dec. 18.	C. E. Phipps,	Milan
Dec. 20.	Peter Brison,	Lancaster
Dec. 20.	Reed Brothers,	New Boston
Dec. 22.	J. W. Crawshaw,	Jefferson
Dec. 27.	Dustin Marshall,	Nashua
Dec. 31.	F. G. Steele,	Hudson

In addition to the action taken by the commissioners in the above-named cases the selectmen have acted in specific cases located in six towns, under the direction of the commissioners. This action by the state, and by the selectmen directed by the state, has resulted in locating and destroying 234 tuberculous cattle and 18 glandered horses. A post-mortem examination has been made of every animal destroyed, and in every instance the disease for which the animal was destroyed has been found, and to such extent as to satisfy the owner of its existence without microscopic examination. In such inspections as seemed to need special attention, or where conditions were likely to exist that would need the

personal attention of members of the commission, they have been present, and these cases have been growing less each year. The work of the commission has been systematized so that the greatest result could be obtained with the least possible expense.

EXPERIMENTAL WORK.

The tuberculin test has been applied to some extent during the work of the commission, and when first announced by supposed authorities, as the proper agency for determining what animals should be killed and buried, was used for a short time as the main dependence in our work. During this trial with tuberculin 296 cattle were condemned and buried from the application of the test, and all were given a post-mortem examination. A thorough observation of the results in this course, and a careful study of the matter as reported from various authorities, convinced the board that the doubt existing in its mind at the start in regard to the practicability of such a course was well founded, and the practice was abandoned except in special cases where its use seemed justifiable. About this time, when the policy of destroying cattle upon the result of the tuberculin test alone was more in doubt in the minds of the members of the board than later, Mr. F. B. Shedd of Northfield offered a fine herd of Holstein cattle for experimental purposes that had failed to pass the tuberculin test. The offer was accepted, and under date of June 25, 1898, the following report was made upon the experiment:

SPECIAL REPORT ON EXPERIMENT.

CONCORD, June 25, 1898.

The attention of the cattle commissioners was called, June 12, 1897, to a herd of thoroughbred Holstein cattle owned by Mr. F. B. Shedd of Northfield, an extensive land owner, cultivating and improving one of the finest farms in New Hampshire. The tuberculin test had been applied by a veterinarian, employed by Mr. Shedd, to twenty-one cattle, twelve of which failed to pass, and in which the temperature reaction

was very high. Two of the twelve were advanced cases of tuberculosis, and had been destroyed before the arrival of the commissioners. The ten animals remaining, to which our attention was called, consisted of nine thoroughbred Holstein cows and a thoroughbred Holstein bull, the latter weighing over 2,000 pounds, all of which were under four years old. We found the nine cows isolated from all other cattle, and so much excitement prevailed that the enclosure in which they were kept was a source of serious alarm to many of the neighboring people. The bull had been assigned the entire barn, and the general appearance of all the cattle was vigorous and healthy.

We stated to Mr. Shedd that it was not our practice to destroy animals simply upon the result of the tuberculin test without other evidence of disease. To this position strong exception was taken by the owner of the cattle, who expressed a very decided opinion that the cattle should be destroyed. After a lengthy discussion of the matter, Mr. Shedd offered to contribute the ten reacting animals free of cost for the purpose of an experiment to determine, as far as possible, the proper course to take with cattle in a similar condition. This generous proposition was accepted by the commissioners, with the understanding that at the end of one year a report of results should be made to the public, and, if advisable at that time, the remaining animals in the experiment should be killed and examined. Some idea of the generosity of the gentleman in contributing the cattle can be obtained from the fact that these ten animals were easily worth $1,000 if sound, and, according to the law of appraisal for condemned animals, would have cost the state $500 if destroyed. The ten animals were taken to Andover June 25, and the year having expired we make a report in accordance with the agreement.

The nine cows were placed upon an isolated farm where they were given such sanitary treatment for the promotion of health as any dairy cattle should have. This includes good ventilation, light, exercise, and moderate feed. The ani-

mals were kept in the open air both day and night, except in stormy weather, and for six months the milk of the entire herd was thrown away or fed to pigs. When these cattle were brought to the town some objections were raised on account of endangering other herds, so intense was the fear of tuberculosis, but there being no objection on the part of the adjoining land owners, there was little attention given to this unnecessary scare. The bull, owing to his size and strength, was kept in another section of the town where he could be properly handled. These animals were tested with tuberculin by a disinterested veterinarian September 12, December 9, February 23, and those not previously killed, May 9. Five of the ten animals passed the test successfully September 12, and five, including the bull, failed to pass. Owing to the inconvenience and expense of keeping the bull, and the supposition on the part of a few people that he was badly diseased, he was killed soon after the test in September, although there was no previous indication of disease from a careful physical examination. He was killed for the purpose of the experiment, and carefully examined by a veterinarian in the presence of many people, but the examination failed to reveal any more evidence of disease than can be found in a large percentage of the cattle in the country to-day. It was so infinitesimal as to require no consideration upon any health basis, and was strong proof of the extravagance in destroying animals by the test alone.

Only three of the nine remaining animals failed to pass the test applied December 9, and in one of the three the disease had developed sufficiently to be detected by physical examination, and was condemned. These three were isolated from the balance of the herd and their milk thrown away. They were again tested February 23 with no material change in the result, and were taken to Concord March 29, and destroyed and examined in the presence of many witnesses. The one condemned by physical examination was found to be a well-developed case of tuberculosis, and should be destroyed. Although the other two, killed at the same time,

had failed to pass the test, there was no physical evidence of disease, and they were destroyed for the purpose of ascertaining their condition and for the information sought in the experiment. After a very thorough post-mortem examination by a veterinarian, slight evidence of disease was finally found, but it was even less than that found in the bull, and was in such condition as to lead to the conclusion that it had not only been arrested but was on the way to ultimate recovery. How much this result was due to the treatment of the animals, and how much to the alleged curative qualities of tuberculin is a matter of conjecture only. There are no developments of science in regard to the nature and characteristics of bovine tuberculosis that warrant the destruction of such animals.

The remaining six animals were tested with tuberculin February 23 and May 9, and all passed the test each time. The following correspondence passed between the commissioners and Mr. Shedd:

Concord, June 18, 1898.

Mr. F. B. Shedd, Tilton, N. H.:

Dear Sir,—When we took the ten Holstein cattle from your place nearly one year ago, the statement was made to you that it was not the policy of the board to destroy such herds as yours appeared to be, simply from the fact that the ten animals had failed to pass the tuberculin test. We remarked at the time that we had a desire to study the development of the disease in such cattle for a year or more, and with your accustomed liberality and public spirit you offered to contribute the ten reacting animals free for the purpose of the experiment, cattle that were, at least, worth $1,000 at that time. We accepted your generous offer, and, as the year has nearly elapsed, it is due that we make a brief report to you and ask for suggestions in regard to further action.

During this period we have destroyed four of the ten animals, and you have been present at the post-mortem of each. One of these showed physical symptoms of the disease soon after it came into our possession, and was condemned by the board. The other three showed no physical symptoms of the disease, and were selected for reasons well known to you, and

which it is not necessary to state here. You will recall the fact that the post-mortem of each revealed no disease sufficient to warrant destroying the animals, or sufficient to cause any danger, except in the one physically condemned. The others were killed for the purpose of the experiment, and the results are carefully recorded, and will be published in full. The milk of none of the cows killed had been sold since we took charge of the animals.

We now have at East Andover the remaining six animals. They have passed the tuberculin test at the last two trials made in February and May, and from any kind of an examination that we are able to make appear to be healthy cattle. Since passing the test the milk has been sold, with the approval of the State Board of Health, the city Board of Health, and the milk contractors, all of whom have been fully acquainted with the history and condition of the animals and furnished the result of the tuberculin test. There has been no expense to the state for these cattle for the past six months. In view of these facts, there seems to be no reason why these cattle should not be put to practical use, and we ask you for suggestions in regard to what shall be done with them. Shall we return them to you? We will gladly do this if you desire. If not, there seem but two courses open, one of which would be to kill them at once. This would seem extravagant, and warranted only for the purpose of obtaining some information in regard to the effect of repeated applications of tuberculin. The other course would be to keep the cattle for another year at least, and watch developments. Whatever is done, the detailed report of the experiment to the present time can be made, and will be a valuable contribution to the information obtained in regard to this important matter. We await with deep interest any suggestions from you in regard to this matter.

Assuring you of our full appreciation of your liberality and public spirit in donating the animals for the purpose of this experiment, and of willingness to return them if you desire,

Yours truly,

N. J. BACHELDER,

Secretary.

Mr. Shedd's reply:

TILTON, N. H., June 21, 1898.

N. J. Bachelder, Esq., Secretary, Concord, N. H.:

DEAR SIR.—I have your favor of June 18, and note what you say with regard to the condition of the cattle remaining in your hands of the herd given by me to your commission for the purpose of obtaining information, by experiment, upon the very important question of the existence and progress of the disease, tuberculosis, with which it was charged they were infected, after having reacted under the inoculation with tuberculin while in my possession.

I remember the consistent and conservative opinion expressed by you at the time when first your attention was called to the matter, and the reasonable course recommended with regard to the treatment of the herd. While, from lack of experience, and perhaps prejudice, I was compelled to differ from the judgment expressed by you, and for the reason that I felt that I could not consistently use the product of cattle that modern science had pronounced diseased. I felt constrained to make such disposition of them as would remove them from the balance of my herd, and prevent any possibility of further contamination, not only of my own but of my neighbors' cattle.

The investigations made by your board, of which I have been made aware from time to time, and the information obtained therefrom, have substantially changed the radical opinion I have heretofore entertained with regard to the prevalence of the disease generally, and especially with regard to the propriety of condemning any and all cattle which might "react" under the tuberculin test. The examination by your commission of the cattle destroyed, after repeated applications of the tuberculin test, has determined, to my satisfaction, the fact that judgment based upon that alone is not a safe reliance, and that cattle should not be destroyed without other evidence of the presence of disease. You will remember that it was upon this point, mainly, that we disagreed. I am

now convinced of the correctness of your judgment upon the question, and while the experiments have not resulted as I expected, I feel satisfied that your investigations will prove of great value to every one interested in cattle, and will do much toward the proper solution of a very important problem.

Your claims as to the superior value of the physical examination in determining the extent of the disease have, in my opinion, been fully sustained, and I am now quite ready to agree with you that it is the more reliable method, and that cattle in which the presence of disease cannot be determined in this way, should not be destroyed.

There remains, however, this question to be solved, and I shall be interested to hear an expression from you upon it. Assuming that the tuberculin test, as applied by me in the beginning, demonstrated the presence of the disease in however slight a form, is it possible that repeated inoculations have not only checked its further development, but effected a complete cure? This, I believe, it was claimed tuberculin would do when it was first offered to the medical profession. If so, such treatment would be of inestimable value.

With regard to the disposition of the six cows remaining in the hands of your commission. As you are aware, they were regarded by me as being of greater value than as mere producers of milk. They were remarkably promising, and were desirable for breeding purposes. Three of them produced each about forty pounds of milk with their first freshening, and this without other than ordinary feeding. What they might have done with extra feed we are not advised, but it is fair to presume that they were of sufficient promise to warrant being kept for the improvement of the herd.

I judge from your letter that you do not feel it necessary for the furtherance of the experiment that they should be destroyed, which course is in harmony with the opinion expressed by you in the beginning; and I also note your generous offer to return them to me. I scarcely know what to say to this proposition. When I turned over the herd to your commission, as a matter of fact, I expected to relinquish all right

to them and to whatever value they represented, expecting and intending to place such value as an offset to whatever expense the state of New Hampshire might be compelled to bear in the conduct of the experiments that were to be made with them. However, if your board shall feel that it will be as well to return them to me as to keep longer and continue to experiment with them, I shall be satisfied to receive them. This I will be pleased to leave with your board to decide, expressing in advance my entire satisfaction with whatever decision you may make.

In closing, I beg to express to your board and to you, personally, my appreciation of the many courtesies received at your hands, and my sincere thanks for the interest you have taken in the investigation of a question of so much importance to every farmer and to every citizen in the state.

Yours respectfully,

F. B. SHEDD.

The cattle were returned to Mr. Shedd June 24, and the experiment closed.

IRVING A. WATSON, *President.*
N. J. BACHELDER, *Secretary.*

The action of the board was, however, criticised in certain quarters, undoubtedly for special and individual purposes, and we therefore determined to destroy the animals and make a careful post-mortem examination, in order to determine whether or not our conclusions were correct. Accordingly, August 1, they were killed and an autopsy made in the presence of the commissioners, a competent veterinary surgeon, and several witnesses, with the following results:

A careful autopsy was made in each case. All the internal organs were searched for evidences of disease, which were found only as stated below:

No. 1. (3790) A small encysted mass, as large as a medium-sized walnut, was found near the apex of one lung. Two of the bronchial glands were somewhat enlarged, and filled with caseous matter of a thick consistency. These were the only lesions found. No evidence of recent inflammatory

action or pus. All the other organs were in a healthy condition.

No. 2. (52) Two of the bronchial glands were enlarged and filled with caseous matter. On a small portion of the left lung, adjacent to the fifth rib, were found granulations, probably miliary, and which also appeared in a small patch on the ribs contiguous to the granulations on the lung. No inflammatory condition existed, and no other evidence of disease was found.

No. 3. Bronchial lymphatics slightly enlarged and containing a small amount of cheesy material, apparently encysted. No other evidence of disease.

No. 4. (366) A small nodular, encysted mass, of the size of an ordinary marble, was found in the apex of one lung. No other evidence of disease.

No. 5. (363) In one of the bronchial glands was found a small mass of caseous matter, cylindrical in shape, about one eighth of an inch in diameter and more than an inch in length, partly calcified. No other evidence of disease.

No. 6. (362) In the upper part of one lung was found a caseous deposit, encysted, the size of a small walnut, with some calcification. In the lower part of the lung was an encysted nodule, about the size of a small cherry, containing caseous matter. No other evidence of disease.

In all the above-mentioned cases a careful examination was made of those organs most likely to be tuberculous, including lungs, liver, heart, stomach, bowels, kidneys, uterus, mammary glands, mesentery, lymphatic and pigmentary glands,— in fact everything except the brain and spinal cord, which it was not deemed necessary to explore.

All the cows were in an excellent condition, and probably would have passed through most, if not all, slaughtering houses without any disease being discovered, with perhaps the single exception of case No. 2, in which the granulations upon the lung, being upon the outer surface, were apparent upon the removal of that organ.

The result of this experiment had great influence in determining the future course of this board. Nearly fifteen months

after these six cattle reacted to the tuberculin they were killed and thoroughly examined, with only the slight traces of the disease as indicated above. This board regards tuberculin, in the hands of a skillful and experienced person, as the most reliable diagnostic agent in this matter, but it also holds a physical examination by a skillful and experienced veterinarian as the most practical course to pursue in the destroying of tuberculous animals. Such a course is believed to be the most practical method of dealing with the disease. Every animal, previous to being destroyed, has been examined and condemned by a qualified veterinarian selected by this board. We have made no appointments of state veterinarians, but employed veterinarians from time to time as their services were required, and their previous work and location justified.

Following is the financial statement for 1897:

FINANCIAL STATEMENT, 1897.

COMPENSATION FOR ANIMALS DESTROYED.

230 tuberculous cattle (one half health value)	$4,325.25
4 tuberculous cattle (action by towns)	67.90
14 glandered horses (diseased value)	67.00
4 glandered horses (action by towns)	48.80
Total paid for animals destroyed	$4,508.95

SERVICES AND EXPENSES OF VETERINARIANS.*

W. T. Russell, Nashua:		
Services	$337.00	
Expenses	168.49	
		$505.49
R. J. MacGuire, Concord:		
Services	$552.75	
Expenses	353.86	
		$906.61
F. V. Barrett, Peterborough:		
Services	$39.50	
Expenses	20.00	
		$59.50

* Expenses of veterinarians include killing and burying condemned animals and railroad, hotel, and livery expenses.

F. C. Wilkinson, Claremont:		
Services	$19.00	
Expenses	7.00	
		$26.00
George G. MacGregor, Whitefield:		
Services	$55.50	
Expenses	70.23	
		$125.73
L. Pope, Jr., Portsmouth:		
Services	$61.00	
Expenses	40.00	
		$101.00
A. L. Dodge, Manchester:		
Services	$25.00	
Expenses	7.00	
		$32.00
George E. Wiggin, Wolfeborough:		
Services	$26.00	
Expenses	29.00	
		$55.00
Richard Ebbitt, Manchester:		
Services	$5.00	
Expenses	4.00	
		$9.00
L. E. Tuttle, Franklin:		
Services	$9.00	
Expenses	1.00	
		$10.00
J. M. Parker, Haverhill, Mass.:		
Services	$8.00	
Expenses	7.00	
		$15.00
George W. Copp, Tuftonborough:		
Services	$2.00	
Expenses	1.00	
		$3.00
		$1,847.63

TRAVELING EXPENSES OF COMMISSION AND EXPENSES OF APPRAISERS.

Inspection at	Whitefield	$9.50	
	Benton	5.40	
	Hinsdale	8.20	
	Jefferson	9.75	
	Warner	4.50	
	Amherst	5.90	
	Temple	5.90	
	Derry	4.20	
	Hudson	4.90	
	Keene	7.10	
	Rye	6.40	
	Greenfield	6.10	
	Laconia	4.80	
	Hudson	4.80	
	Jefferson	11.20	
	Manchester	4.20	
	Contoocook	4.22	
	New Ipswich	5.70	
	Northfield	2.40	
	Northfield	2.40	
	Greenland	5.30	
	Meredith	5.60	
	Greenland	5.30	
	Jefferson	9.75	
		$143.52	
A. K. Day, microscopic examination		2.00	
			$145.52

Total expense of inspection of 283 stables, appraising, destroying, and burying 230 tuberculous cattle and 14 glandered horses, $1,993.85.

EXPERIMENT WITH TEN HOLSTEIN CATTLE.

Moving cattle	$6.00	
Lumber	11.50	
Hardware	20.40	
Labor	27.00	
Feed and disinfectants	10.00	
Grain	37.50	
Pigs	20.00	
Labor	45.00	
Pasturage	50.00	
Veterinarians' services	10.00	
Moving, handling, and keeping bull	50.00	
		$287.40

OFFICE EXPENSES.

Expense of two meetings with Massachusetts Cattle Commission	$12.50	
Clerk hire	500.00	
		$512.50
Total expense for the year		$7,302.70
Appropriation		$10,000.00
Expended		7,302.70

An itemized exhibit of the foregoing expenditures, with accompanying vouchers, has been submitted to the governor and council, approved, and placed on file.

INSPECTIONS MADE IN 1898.

The same general plan was followed in 1898, as follows:

1898, Jan. 7.	J. J. Bean,	Candia
Jan. 7.	Hiram Blanchard,	Stewartstown
Jan. 10.	W. O. Smith,	Boscawen
Jan. 12.	A. P. Farrar,	Hillsborough
Jan. 14.	M. H. Fiske,	Temple
Jan. 15.	J. H. Foster,	Amherst
Jan. 15.	F. A. Holbrook,	Amherst

Jan. 15.	Robert Converse,	Amherst
Jan. 18.	J. E. Favor,	Bennington
Jan. 21.	Thomas K. Allen,	Derry
Jan. 21.	H. A. Hill,	Derry
Jan. 21.	Cyrus Keith,	Hollis
Jan. 21.	J. R. Swallow,	Nashua
Jan. 21.	E. Q. Shattuck,	Nashua
Jan. 21.	C. J. Bell,	Hollis
Jan. 25.	St. Paul's School,	Concord
Jan. 26.	Charles N. Wyman,	Winchester
Jan. 27.	Jacob Kendall,	Temple
Feb. 8.	Charles Hoitt,	Goffstown
Feb. 12.	F. C. Stone,	Berlin
Feb. 15.	E. W. Colburn,	Francestown
Feb. 21.	J. E. Ring,	Bedford
Feb. 23.	J. A. Sanders,	Hudson
Feb. 23.	C. H. Holden,	Nashua
Feb. 25.	S. H. Dunbar,	Wilton
Feb. 25.	Frank May,	Wilton
Mar. 1.	State Industrial School,	Manchester
Mar. 1.	W. K. Locke,	Pittsfield
Mar. 3.	John Costello,	Lancaster
Mar. 3.	Reuben G. Carter,	Lancaster
Mar. 4.	James Gissemer,	Jefferson
Mar. 4.	W. S. Thayer,	New Ipswich
Mar. 4.	C. H. Balcom,	Wilton
Mar. 4.	H. O. Hadley,	Temple
Mar. 4.	A. O. Childs,	Mason
Mar. 4.	Mrs. E. J. Smith,	Nashua
Mar. 15.	S. F. Hayes,	Harrisville
Mar. 16.	Henry Annis,	Warner
Mar. 16.	L. W. Ladd,	Tuftonborough
Mar. 22.	D. Austin,	Rindge
Mar. 23.	State Industrial School,	Manchester
April 1.	Morris Christie,	Antrim
April 1.	C. E. Sawyer,	Greenville
April 1.	C. H. Moore,	Wilton
April 1.	J. M. Holden,	Wilton
April 1.	Ben Haigh,	Salem
April 2.	L. M. Robie,	Piermont
April 2.	George A. Trow,	Milford
April 2.	H. A. Glover,	Merrimack
April 2.	Charles J. Upham,	Amherst
April 5.	Read Brothers,	New Boston

April 8.	J. H. Dolber,	Epsom
April 11.	H. W. Lear,	Sunapee
April 11.	F. W. King,	Marlow
April 11.	William Mellen,	Unity
April 12.	R. J. Corey,	Acworth
April 13.	J. B. Case,	Francestown
April 14.	Mrs. John Flanders,	Benton
April 15.	George Sargent,	Henniker
April 16.	A. B. Kendall,	Hampstead
April 25.	W. S. Libby,	Whitefield
May 1.	John Donegan,	Manchester
May 3.	J. S. Green,	Epsom
May 5.	W. L. Bean,	Tuftonborough
May 5.	J. Montgomery,	Derry
May 6.	Charles Peaslee,	Canterbury
May 6.	George C. Parsons,	Gilmanton
May 6.	Thomas Jackson,	Mason
May 6.	G. R. Mansur,	Mason
May 7.	F. S. Whittemore,	Temple
May 7.	Henry Hosmer,	Mason
May 9.	A. S. Little,	Hampstead
May 10.	C. W. Muzzy,	Milan
May 10.	John Christanson,	Milan
May 12.	Mrs. C. A. Kilburn,	Merrimack
May 12.	Lester T. Patch,	Hollis
May 12.	A. R. Britton,	Hollis
May 12.	F. H. Stone,	Milford
May 12.	L. K. Hutchinson,	Milford
May 12.	H. A. Fuller,	Amherst
May 12.	George E. Holbrook,	Amherst
May 13.	John Moore,	Manchester
May 13.	Peter Brison,	Lancaster
May 13.	Orrison Webber,	Manchester
May 14.	V. R. Davis,	Lancaster
May 14.	W. C. Nichols,	Henniker
May 16.	F. J. Robinson,	Meredith
May 21.	W. A. Barns,	Claremont
May 27.	James Parsons,	Rye
May 28.	E. L. Purrington,	Chester
May 28.	L. Richardson,	Chester
June 1.	John A. Thompson,	Epping
June 2.	August Weisman,	Bow
June 3.	George M. Anderson,	Danville
June 3.	M. M. Twomey,	Windham

June 6.	Estate J. E. Barton,	Temple
June 6.	E. F. Blanchard,	New Ipswich
June 6.	L. W. Felt,	Temple
June 6.	Hattie J. Stone,	Mason
June 6.	Fred O. Gould,	Weare
June 7.	Mrs. J. Whittemore,	Litchfield
June 8.	W. F. Jowders,	Rindge
June 8.	J. H. Nutter,	Bath
June 10.	Frank Staples,	Tuftonborough
June 11.	Ira B. Hall,	Jefferson
June 11.	Edwin Plummer,	Auburn
June 13.	E. R. French,	Bedford
June 14.	G. W. Chandler,	Grafton
June 20.	Alonzo Pease,	Freedom
June 21.	John Christanson,	Milan
July 6.	Henry Cochrane,	Somersworth
July 8.	P. L. Clark,	Francestown
July 9.	W. I. Martin,	Chester
July 11.	W. D. Perkins,	Concord
July 11.	H. E. Blake,	Franklin
July 12.	M. W. Hoyt,	Northwood
July 13.	James Parsons,	Rye
July 13.	J. F. Hammer,	Nashua
July 13.	William McQuestion,	Merrimack
July 14.	S. F. Adams,	Greenville
July 15.	A. G. Rand,	Hampstead
Aug. 1.	F. B. Shedd,	Northfield
Aug. 2.	S. E. Ober,	Webster
Aug. 2.	F. P. Rand,	Tilton
Aug. 2.	Mrs. George Small,	Wilton
Aug. 2.	A. C. Wilkins,	Temple
Aug. 2.	C. H. V. Smith,	Milford
Aug. 2.	John A. Fitch,	Wilton
Aug. 4.	J. F. Tenney,	Antrim
Aug. 5.	George W. Brown,	Deerfield
Aug. 9.	Pressey & Emerson,	Hampstead
Aug. 9.	T. M. Holmes,	Derry
Aug. 9.	Fred M. Page,	Salem
Aug. 10.	Charles H. F. Perry,	Peterborough
Aug. 12.	F. B. Huckins,	Hebron
Aug. 15.	L. P. Duncklee,	Nashua
Aug. 18.	George S. Hoyt,	Sandwich
Aug. 20.	David Langway,	Whitefield
Aug. 22.	James M. Hook,	Hopkinton

Aug. 23.	G. A. Duncklee,	Francestown
Aug. 23.	Ralph Tenney,	Hollis
Aug. 23.	C. E. Eastman,	Hollis
Aug. 23.	Horatio Bowers,	Merrimack
Aug. 23.	John Woods,	Merrimack
Aug. 24.	Otis Robbins,	Greenville
Aug. 24.	F. J. Marshall,	Greenville
Aug. 25.	George L. Theobald,	Concord
Sept. 12.	Frank Ingerson,	Mason
Sept. 17.	J. H. Parmenter,	Derry
Sept. 20.	L. M. Robie,	Piermont
Sept. 21.	Ford & Gunn,	Rumney
Sept. 21.	J. N. Dodge,	Peterborough
Sept. 24.	S. T. Simonds,	Hopkinton
Sept. 24.	H. F. Patch,	Hollis
Sept. 24.	F. H. Parker,	Amherst
Sept. 24.	S. F. Upham,	Amherst
Sept. 27.	W. C. Hawksworth,	Goshen
Sept. 28.	A. B. Davidson,	Temple
Sept. 28.	W. A. Lovering,	Hudson
Sept. 28.	E. E. Colburn,	Temple
Oct. 1.	C. A. Whidden,	Wolfeborough
Oct. 1.	James Brown,	Sandwich
Oct. 1.	Charles O. Smith,	Sandwich
Oct. 1.	N. A. Barrows,	Sandwich
Oct. 8.	J. G. Russ,	Pembroke
Oct. 11.	J. G. Wells,	Gorham
Oct. 12.	J. Arthur Richards,	Goffstown
Oct. 18.	W. H. Dow,	Conway
Oct. 19.	Mrs. D. W. Russell,	Wilton
Oct. 19.	George T. Blanch,	Greenville
Oct. 19.	L. H. Hodgman,	Greenville
Oct. 24.	L. Ledoux,	Nashua
Oct. 27.	J. E. Seavey,	Greenland
Nov. 1.	Charles Smith,	Sandwich
Nov. 1.	Fred Mack,	Sandwich
Nov. 1.	Charles S. Hoyt,	Sandwich
Nov. 1.	Fred Atwood,	Sandwich
Nov. 1.	M. S. Brown,	Sandwich
Nov. 2.	Joseph C. Winter,	Goshen
Nov. 3.	W. R. Stockwell,	Lancaster
Nov. 4.	W. M. Jewett,	Jefferson
Nov. 9.	Charles E. Claflin,	Lebanon
Nov. 10.	Charles S. Davis,	Warner

Nov.	10.	Timothy Peaslee,	Henniker
Nov.	13.	George Knight,	Plaistow
Nov.	14.	G. Jackson,	Cornish
Nov.	15.	George P. Coffran,	Allenstown
Nov.	16.	B. W. Rowell,	Boscawen
Nov.	18.	John D. Smith,	Moultonborough
Nov.	21.	Herbert O. Hadley,	Temple
Nov.	21.	M. R. Hodgman,	Greenville
Nov.	21.	F. N. Ingerson,	Mason
Nov.	21.	J. O. Reed, Jr.,	Mason
Nov.	21.	C. A. Maxwell,	Greenville
Nov.	21.	Charles T. Wheeler,	Greenville
Nov.	26.	Norman Mathews,	Henniker
Nov.	30.	G. M. Anderson,	Danville
Dec.	1.	B. W. Cate,	Manchester
Dec.	1.	Otis S. Sanborn,	Sanbornton
Dec.	2.	Robert Oliver,	Weare
Dec.	2.	S. C. Heald,	Wilton
Dec.	2.	Ella F. Bailey,	Greenfield
Dec.	2.	Mary B. Langdell,	Wilton
Dec.	3.	E. R. French,	Bedford
Dec.	3.	S. B. Tuttle,	Lee
Dec.	3.	J. B. Trow,	Amherst
Dec.	3.	George F. Lynch,	Amherst
Dec.	3.	S. H. Dunbar,	Wilton
Dec.	5.	O. P. Titus,	Lyman
Dec.	6.	S. J. Merrill,	Goffstown
Dec.	9.	E. P. Sawyer,	Freedom
Dec.	9.	J. E. Deering,	Lancaster
Dec.	9.	J. M. Hook,	Hopkinton

FINANCIAL STATEMENT, 1898.

COMPENSATION FOR ANIMALS DESTROYED.

148	tuberculous cattle (one half health value) .	$2,894.00
20	glandered horses (diseased value) . .	121.90
	Total paid for animals destroyed . . .	$3,015.90

SERVICES AND EXPENSES OF VETERINARIANS.

W. T. Russell, Nashua:		
Services	$245.00	
Expenses	126.45	
		$371.45

R. J. MacGuire, Concord:		
Services	$452.00	
Expenses	302.18	
		$754.18
F. V. Barrett, Peterborough:		
Services	$14.00	
Expenses	2.25	
		$16.25
George G. MacGregor, Whitefield:		
Services	$46.00	
Expenses	49.96	
		$95.96
A. L. Dodge, Manchester:		
Services	$53.00	
Expenses	12.00	
		$65.00
J. M. Parker, Haverhill, Mass.:		
Services		$7.00
George W. Copp, Tuftonborough:		
Services	$20.50	
Expenses	11.00	
		$31.50
A. F. Abbott, Manchester:		
Services	$4.00	
Expenses	2.00	
		$6.00
		$1,347.34
Herbert O. Hadley, Temple, appraiser, services and expenses	$119.20	
Rumford Printing Company	8.25	
A. K. Day, microscopic examination	2.00	
		$129.45

TRAVELING EXPENSES OF COMMISSIONERS.

Inspection at Hillsborough	$4.39
Winchester	3.25
Berlin	8.20
Manchester	.72

Inspection at Lancaster	$7.60	
Hudson	3.20	
Nashua	2.70	
		$30.06

Total expense of inspection of 113 stables, locating, destroying, and burying 148 tuberculous cattle and 20 glandered horses, $1,506.85.

EXPERIMENT WITH TEN HOLSTEIN CATTLE.

Labor	$60.00	
Hay	147.67	
Grain	52.55	
Veterinarians' services	27.00	
Microscopic examination	6.00	
Freight	5.25	
Butchering, examining, burying, and incidental expense	29.00	
	$327.47	
By products sold	131.28	
		$196.19

OFFICE EXPENSES.

Incidental expense	$6.70	
Clerk hire	500.00	
		$506.70
Total expense for the year		$5,225.64
Appropriation		$10,000.00
Expended		5,225.64

An itemized exhibit of the foregoing expenditures, with accompanying vouchers, has been submitted to the governor and council, approved, and placed on file.

CONCLUSIONS.

Our experience and study in the suppression of bovine tuberculosis convinces us that the enforcement of proper sanitary measures for preventing the development of the disease is as important as destroying diseased animals. A stable once thoroughly infected with tuberculous germs is a very prolific source of the disease, even years later, unless thoroughly disinfected. We have given directions to the owner of every stable inspected in regard to the action required in the matter of ventilation, light, exercise of animals, and disinfection, and have regarded this as the most important part of the work. Many stables have been visited very recently to ascertain if the suggestions have been carried out, and we found that the changes suggested have been invariably made, and that the sanitary conditions of those stables have been greatly improved. Quite a thorough investigation of the conditions existing in the sections of the state where the disease has been found the most prevalent, reveals the fact that great progress has been made in its suppression, and in some towns it seems to be almost eradicated. In July we wrote to the chairman of the board of selectmen in forty towns where the most tuberculous cattle have been found, asking for an expression of opinion in regard to the prevalence of the disease in the town as compared with any previous time, and received replies from thirty-four towns. We take the liberty of printing all replies received without discrimination, in order that the views of those in best condition to judge in regard to the efficiency of the work may be made known.

LETTERS FROM SELECTMEN.

Amherst.

AMHERST, July 12, 1898.

In reply, will say that I think there are not so many cases of tuberculosis in town as one year ago. I think it grows less.

LUTHER B. CONVERSE,
Chairman.

Antrim.

ANTRIM, July 22, 1898.

Yours at hand in regard to prevalence of tuberculosis. I think there is but very little in town.

MILTON TENNEY,
Chairman.

Bennington.

BENNINGTON, July 18, 1898.

In regard to tuberculosis among the cattle in town will say that I consider them exceedingly free from disease. More so than at any previous time.

H. A. EATON,
Chairman.

Brookline.

BROOKLINE, July 22, 1898.

I have been talking with the members of the board of selectmen, and we do not know of any cases of tuberculosis in the town for a year.

ALBERT W. CAREY,
Chairman.

Bedford.

BEDFORD, July 23, 1898.

In regard to tuberculosis in the town of Bedford will say that I do not know of a case, and in my opinion there are but few, if any, cases in town.

L. M. KINSON,
Chairman.

Chichester.

CHICHESTER, July 25, 1898.

In answer to your inquiry will say that I can report a decrease in the disease you call attention to. There has been no case in the town for twelve months to my knowledge.

C. A. LANGMAID,
Chairman.

Chester.

CHESTER, July 26, 1898.

Will say, in reply to your question about tuberculosis, that I think there is not much change. There are more cows kept in town, also a slight increase in tuberculosis.

CHARLES H. EDWARDS,
Chairman.

Francestown.

FRANCESTOWN, July 29, 1898.

I will say that in my opinion the town is freer from tuberculosis than in any previous years.

CHARLES A. PATCH,
Chairman.

Greenville.

GREENVILLE, July 13, 1898.

In reply will say that at present, and for some time in the past, have had no knowledge of any cases of tuberculosis in town, and am very positive that there is much decrease, and that the disease is practically stamped out.

JAMES B. FRY,
Chairman.

Greenfield.

GREENFIELD, July 23, 1898.

We have not heard of a case of the disease up to the present time, although we have no doubt but there are some affected.

C. M. GIPSON,
Chairman.

Goffstown.

GOFFSTOWN, July 15, 1898.

I have made some inquiry since receiving your letter, and do not think tuberculosis is very prevalent here at the present time.

GEORGE PATTEE,
Chairman.

Hillsborough.

Hillsborough Bridge, July 12, 1898.

I have not heard of a case of tuberculosis this season, and very few cases for the last three years, and in my opinion the cases are very few, if any, here.

Frank M. Parker,
Chairman.

Henniker.

Henniker, September 4, 1898.

My opinion is that tuberculosis does not prevail among cattle in this vicinity as it did two or three years ago. I consider the efforts of your board have been excellent towards checking this disease. Farmers are making a study of it, educating themselves as best they can to prevent its spread. Ventilation, the chief requisite for healthy cattle, is being looked after much more at the present time than a few years ago. The experiments, and reports of the same sent over the state by your board, have been the means of doing much good.

E. N. Cogswell,
Chairman.

Hudson.

Hudson, July 14, 1898.

I have not heard of a case of tuberculosis in this town for some time. Think the cases are very rare, if any.

J. F. Wilson,
Chairman.

Hopkinton.

Hopkinton, August 1, 1898.

We have not had a case of tuberculosis for a long time, and think it is on the decrease.

E. G. Runnells,
Chairman.

Hancock.

HANCOCK, July 23, 1898.

In regard to your letter asking about tuberculosis, will say there does not appear to be any amount of it in town. Have heard of no cases for a long time.

C. H. WARE,
Chairman.

Hampstead.

HAMPSTEAD, July 25, 1898.

In reply to yours in regard to the prevalence of tuberculosis in this town, I can say that from my limited knowledge of it I am sure it has in a large measure been stamped out during the last few years. During the seven years I have served as a selectman, whenever I have found a suspicious case I have always insisted that your board should be promptly notified, and as a result you have killed several animals in town. I am of the opinion that the disease is very rare indeed. I think your board deserves the highest praise for the prompt and conservative action taken.

C. W. GARLAND,
Chairman.

Hollis.

HOLLIS, July 25, 1898.

In reply to your inquiry in regard to the prevalence of tuberculosis will say that I have not heard of a case of late. As your experiment proves, and as I have always believed, the physical examination is the proper method to adopt.

NEWTON F. HOLCOMB,
Chairman.

Litchfield.

LITCHFIELD, July 23, 1898.

In reply will say that I have not known or heard of a suspected case of tuberculosis in this town for some time. It may exist, but not of sufficient extent to be found from a

physical examination, and such cases I do not consider sufficiently dangerous to warrant killing.

J. A. Marsh,
Chairman.

Lyndeborough.

Lyndeborough, July 23, 1898.

I do not think there are as many cases in town as there were a few years ago. The farmers are paying more attention to the ventilation of stables and not as many diseased cattle have come from Brighton as formerly. I think the board of cattle commissioners of this state is pursuing the right course.

Andy Holt,
Chairman.

Merrimack.

Thornton's Ferry, July 18, 1898.

Your letter requesting an opinion in regard to the prevalence of tuberculosis among the cattle of this town compared with any previous time is received. In reply will say that as far as my knowledge goes we have had but three cases in the past three years; one in 1896, two in 1897, and none this year.

James B. Hoitt,
Chairman.

Milford.

Milford, July 18, 1898.

In reply will say that my official experience for the past six or seven years has led me to believe that the cases of this disease have been decreasing each year, until to-day I think there are no cases in town. At one time, some six years ago, we had on one farm some twenty cases, and the destruction of these animals eradicated the disease from that section of the town. In another section some five or six cows were killed, and since then there has been only an occasional case. We have called upon your board for the inspector two or three times during the year, but the sickness has not proven to be

tuberculosis, and was largely due to unsanitary conditions. From a personal inspection of nearly every herd in town, I can report them, with hardly an exception, in healthy condition, notwithstanding the bad conditions of some of the stables.

GEORGE A. WORCESTER,
Chairman.

Mont Vernon.

MONT VERNON, July 25, 1898.

Yours of July 20, asking my opinion in regard to the prevalence of tuberculosis in the cattle of this town, received. I know of none suspected to have this disease at this time.

W. L. ROBINSON,
Chairman.

Mason.

MASON, July 24, 1898.

We do not seem to hear as much about tuberculosis as a few years ago. Either the scare is off, or the number less. We were pleased to read your special report.

J. O. REED, JR.,
Chairman.

New Boston.

NEW BOSTON, July 27, 1898.

I think tuberculosis in cattle in our town is on the decrease. One great reason for this, in my mind, is because our farmers have taken more pains to have their stables well ventilated.

WILL O. DODGE,
For Chairman.

New Ipswich.

NEW IPSWICH, July 21, 1898.

In regard to tuberculosis among the cattle of our town, I will say that I do not think we have been so free from it for a number of years. It is decreasing, I think.

E. F. BLANCHARD,
Chairman.

Peterborough.

PETERBOROUGH, July 20, 1898.

In reply will say that I do not think there is as much tuberculosis in the cattle of this town as there has been for several years. We have had no complaints, and have seen no evidence of it for some time.

C. B. DAVIS,
Chairman.

Pittsfield.

PITTSFIELD, August 10, 1898.

In reply I will say I do not think there is as much tuberculosis in our town at the present time as compared with the past five years. I think it has decreased fifty per cent during the past year.

W. E. JOY,
Chairman.

Pelham.

PELHAM, July 13, 1898.

In reply will say I have not heard of a case of tuberculosis in the town for two years. I do not believe the law has been any benefit to any state. There is no cause for alarm about tuberculosis in Pelham, nor never was.

O. L. SEAVEY,
Chairman.

Salem.

SALEM, August 6, 1898.

I have inquired of owners of the large herds of cattle in town, and should say that the disease is more prevalent in the past five or six years than before this period, although I know of no marked cases at the present time. My opinion is that the disease is on the increase, although after further investigation it might prove otherwise.

FRANK D. WILSON,
Chairman.

Temple.

TEMPLE, July 21, 1898.

There is very little of the disease in town at present compared with what there has been in the past. I think the disease is held in check well.

ALBERT B. DAVIDSON,
Chairman.

Weare.

EAST WEARE, July 15, 1898.

I think tuberculosis is less prevalent among the cattle at the present time than it was at the corresponding time in 1897. In fact, I am not aware of any case in town.

W. H. DOW,
Chairman.

Windham.

WEST WINDHAM, July 30, 1898.

There have not been any cases of tuberculosis among the cattle of Windham for some time. I should say the disease is decreasing here.

A. L. BARKER,
Chairman.

Wilton.

WILTON, July 23, 1898.

In reply will say that tuberculosis in this town is not as prevalent as formerly. There have not been nearly as many cases this year as in 1896 and 1897.

GEORGE M. HARTSHORN,
Chairman.

Investigation made by the board in various directions demonstrates the correctness of the general statement found in these printed communications, that bovine tuberculosis has been very materially reduced among the herds of the state, and warrants the further statement that New Hampshire cattle are in a comparatively healthy condition, and that their product is as wholesome as a more radical and expensive policy on the part of the commission would have secured.

We desire to emphasize the statement made in previous reports of this board, and already made in this report, that the adoption of preventive measures on the part of stock owners is a matter of equal importance in the permanent suppression of bovine tuberculosis with the destroying of diseased animals. Such matters as ventilation, sunlight, exercise, and judicious feeding are of the greatest importance, and any action that will lead to a more general adoption of these preventive measures will greatly aid in securing the result contemplated. We have less doubt than ever before in regard to the wisdom of the policy adopted and followed by the New Hampshire cattle commission, and believe it to be the most practical method of dealing with bovine tuberculosis. In order to demonstrate that this policy is supported by the organizations most interested in the matter, both from the standpoint of public health and agriculture, we here submit the action taken by the several organizations referred to in this connection, and which have been kept fully informed from time to time of the policy adopted.

IRVING A. WATSON, *President,*
N. J. BACHELDER, *Secretary,*
State Board of Cattle Commissioners.

CERTIFICATES.

STATE OF NEW HAMPSHIRE.

BOARD OF AGRICULTURE,

CONCORD, December 14, 1898.

At a meeting of the board of agriculture, held December 15, 1898, the following action was taken:

Resolved, That this board approves the action taken by the New Hampshire cattle commission, and indorses the policy pursued as one calculated to serve the health and live stock interests of the state in the most practical and economical

manner, and has no change to suggest in the management of this important matter.

A true copy of record. Attest:

N. J. BACHELDER,
Secretary.

NEW HAMPSHIRE STATE GRANGE.

OFFICE OF EXECUTIVE COMMITTEE,
CONCORD, December 9, 1898.

This is to certify that the executive committee of the New Hampshire state grange has been kept fully informed, from time to time, in regard to the work of the state cattle commission, and hereby declares that it is in full accord with the policy pursued, believing it to be the most practical course of suppressing bovine tuberculosis and other contagious diseases of animals. We have noted the result of the experiment conducted with the Holstein herd of cattle and recognize great value to the live stock interests of the state therefrom.

E. C. HUTCHINSON,
Secretary Executive Committee.

N. J. Bachelder, Secretary Board of Cattle Commissioners, Concord, N. H.:

DEAR SIR,—I have been very much interested in the work of the board of cattle commissioners, believing that they are doing very much for the state of New Hampshire. From such information as I have had, it would seem that your work is for two specific reasons: First, the suppression of tuberculosis in cattle to further the public health interests of the state; second, the control of the disease in the financial interests of the stock-raiser and the farmer. The State Board of Health is especially interested in this work from the standpoint of the first proposition, and we believe that every possible effort should be made to protect the public against disease infection through tuberculous meat and milk. To accomplish this end I believe it is the opinion of most scien-

tists that it is unnecessary to destroy every animal that reacts to the tuberculin test, and that it is unnecessary to test with tuberculin every herd of cattle in the state. It would seem that if a careful and systematic inspection of cattle could be made by competent veterinary surgeons, with the destruction of all animals in which tuberculosis could be discovered upon a careful physical examination, the work would meet all public requirements. I understand that, as far as the law will admit, the work is now being conducted along these lines, and as far as I know is meeting with general approval.

I believe that the law should be amended so as to require an inspection of all dairies and milch cows with such frequency as might be deemed necessary, and that the commission should have power to establish rules and regulations governing the sanitary condition of the stables of all dairy herds.

Very respectfully, your most obedient servant,

G. P. CONN, M. D.,
President State Board of Health.

SOME OBSERVATIONS ON BOVINE TUBERCULOSIS IN NEW HAMPSHIRE.*

By Irving A. Watson, A. M., M. D., president state board of cattle commissioners, secretary state board of health, concord, n. h.

In order to show in part the experience and observations upon which some of the conclusions of this paper are based, a brief history of the official recognition of bovine tuberculosis in New Hampshire is necessary.

In 1891 the legislature enacted a law creating a state board of cattle commissioners, and also provided in the organic act that the secretary of the State Board of Agriculture, the master of the State Grange of Patrons of Husbandry, and the secretary of the State Board of Health should, *ex officio*, constitute the board.

The act carried with it an annual appropriation of ten thousand dollars, and gave the board ample authority and power in every particular to take such action as it might deem best in its efforts to suppress the disease.

In the organization of the board the secretary of the State Board of Heatlh was made president, and the secretary of the State Board of Agriculture secretary and executive officer, and as both of these were already salaried officers of the state, no draft has ever been made for salaries upon the annual appropriation of the cattle commission, except for the services of veterinary surgeons and for clerical work, so that the greater bulk of the appropriation has been available to pay indemnities for cattle destroyed.

* Read at the Twenty-Sixth Annual Meeting of the American Public Health Association, held at Ottawa, Canada, September 27-28, 1898. Appended to report of cattle commissioners.

During the first two years of the work of the board the outlay was small, for the reason that the law provided that all animals destroyed should be paid for at their value in the diseased state. As the board took the ground that a tuberculous animal was practically worthless, small awards were made, and for this reason it is probable that some cases were concealed which would have been brought to the notice of the board had the compensation to the owners been greater.

In 1893 the legislature amended the law by providing that all animals destroyed by order of the commission should be paid for at one half the value of the animal in health.

Among the rules adopted by the board was one requiring that all applications for the examination of animals should be made through the selectmen of the respective towns. The board also established a quarantine against cattle from Massachusetts, because it was the practice to send many herds from that state annually into New Hampshire for pasturage, and it was found that by far the greater prevalence of bovine tuberculosis was in that section of the state so used for pasturage. As a result of the quarantine regulations it was found that from 8,000 to 10,000 cattle were brought annually into the state from Massachusetts, and subsequent investigations of the board showed that very frequently tuberculous animals were disposed of for a few dollars in New Hampshire, and not taken back to Massachusetts, thus accounting for the large number of cases in that particular district. Later quarantine was enforced in all cases where animals were brought into the state.

The people of the state, through the publications of the State Board of Health, the State Board of Agriculture, the State Grange, and addresses at agricultural and dairymen's associations, became comparatively well informed regarding this disease, as was shown by the fact that in 1895 the legislature of the state passed, almost unanimously, a bill appropriating $100,000 for the use of the State Board of Cattle Commissioners, with which to begin a systematic examination of all the cattle in the state, and for the destruction of all

those found to be tuberculous; but the governor vetoed the bill. These facts are given in order to show how much interest has been taken in this work, and is the foundation of our belief that the cattle owners throughout the state, almost without exception, have asked for an investigation whenever they have suspected tuberculosis in their herds.

From the organization of the board in 1891, to September 1 of the present year, the commissioners have examined 1,846 herds of cattle, the total number of which, although not recorded, represents many thousands of cattle. From this number 1,483 cattle were destroyed by order of the board, of which 296 were condemned upon the tuberculin test, and 1,187 upon physical examination. The tuberculin test has been applied to 1,362 cattle. It should be borne in mind that examinations have been made only in cases where the disease was suspected, and upon application therefor.

Fourteen hundred and eighty-three post-mortems were made, or, in other words, every creature killed was examined. Of this number evidences of tuberculosis were found in 1,478, leaving only five cases in which the disease was not discovered.

The statement sometimes made that bovine tuberculosis may be eradicated is not borne out in practical dealings with the disease, or from any point of view, except the theoretical one that it would be possible under certain conditions to destroy all tuberculous germs. It is as well first as last to abandon the idea that tuberculosis in cattle will be eradicated, and direct our energies to reducing the disease to the lowest possible degree. In order to stamp out the disease entirely it would become necessary to destroy all tuberculous animals and persons, and to hold all others in strict quarantine until all the existing germs of the disease were destroyed.

Suppose it were possible in a single year to destroy every case of bovine tuberculosis, and to disinfect every stable, how long would it be before re-infection would take place through tuberculous persons?

We believe that if the state would maintain sufficient supervision over its cattle to destroy all cases of tuberculosis that

could be detected by a careful and thorough physical examination by competent veterinary surgeons, the danger of infection from tuberculous meat and milk would be reduced practically to a minimum. This is a work, too, which would be practicable in every state, and which could be carried on without extraordinary appropriations.

That this can be accomplished chiefly by a physical examination of the suspected animal, is a conclusion which we have arrived at almost wholly from our own experience. The first two or three years' work of the board was conducted entirely through physical examinations. Later, we adopted tuberculin as a diagnostic agent in 1,362 cases, and 296 cattle were condemned on the evidence of the reaction from this agent. A very large percentage of these cattle, as shown by post-mortem examinations, were in our judgment so slightly affected as not to be an element of danger to the community; while those that were so far diseased as to lead to the belief that they should be included in the really dangerous class, could have been diagnosed by physical examination. We, therefore, suspended the use of tuberculin, except possibly in an occasional case, for the purpose of corroborating a diagnosis already made.

As already stated, we believe that a majority of the cattle reacting to the tuberculin test are not diseased to an extent that requires their slaughter for the protection of the public health. This conclusion has been arrived at, not only by the cattle commissioners of New Hampshire, but also by Massachusetts and Connecticut, at least, of the New England states.

Massachusetts, up to the present year, had expended the enormous sum of $700,000 in the destruction of tuberculous animals in that state, condemned largely through the tuberculin test; but this policy has been entirely abandoned, and the position taken by New Hampshire is endorsed by Peters and other prominent authorities, who were formerly strong advocates of the slaughter of all animals that reacted to tuberculin.

Under this test we have destroyed many animals in which

only the slightest evidences of the disease could be discovered, as, for instance, a single gland in which the tubercular process was barely discernible; in others, a single gland, or more, enlarged, filled with cheesy matter and already taking on calcification; and in still other cases, complete calcification or encystment had taken place.

It is a well known fact that tuberculin does not in the least reveal the degree of infection. Experience has also shown that it is not so reliable a test as was formerly supposed. Salmon admitted some five years ago* that while "tuberculin is a great aid in the diagnosis of tuberculosis, it is not infallible, and may lead to some errors."

Prof. James Law, than whom no man in this country has done more to encourage the use of tuberculin, and to cause others to place implicit faith in it, has recently written a paper on "Tuberculosis in Cattle and Its Control," published as a bulletin from the Cornell University Agricultural Experiment Station, which is a remarkable modification of his former views in regard to this disease. In this paper he cites eleven conditions under which tuberculin as a diagnostic agent is unreliable. This admission shows how impossible it is to detect, by any known agent, every infected animal in a herd.

Professor Law admits that tuberculin has been objected to because it detects, under favorable conditions, even the slightest and most latent case of tuberculosis, some of which would recover and many would remain useful for years; and, also, "if the latent cases are to be retained in the herd and the advanced cases only removed, then truly tuberculin should have no place in your system; physical examination should be all-sufficient for your purpose."

The paper itself is one from which an argument may be made almost as well in favor of or against the use of tuberculin, from whichever point of view one prefers to look at it. He cites examples of the successful extinction of tuberculosis in infected herds through physical examination and disinfec-

* Transactions of the American Public Health Association, 1893.

tion, sufficient to satisfy the most critical, the proof of which was in the final subjection of all the animals to the tuberculin test, with the result that not a single case was found, and this in a herd of about two hundred head of cattle, fifty per cent of which had been condemned upon physical examination.

In our own experience we have found instances in which tuberculosis existed, although the animal did not react to tuberculin. As an illustration: On May 2, 1896, we were asked to examine a herd of cattle in the city of Rochester, upon a farm where, a few years previously, an entire herd of forty animals had been destroyed under the tuberculin test. The herd consisted of seventeen cattle, fifteen of them reacting to the tuberculin test; but the entire herd was destroyed, and the two that did not react were found to be tuberculous like the others. A sufficient number of experiences of this kind have occurred in our own work to show that this agent is by no means infallible.

As the most efficient means of preventing the spread of tuberculosis, the conclusion has been forced upon us that sanitation must rank first. Whenever we have found tuberculosis to exist extensively in a herd of considerable proportions, we have invariably found one of two conditions in connection therewith, to wit: That the animals were stabled in close quarters, with an entire absence of proper ventilation and cleanliness, thereby maintaining an atmosphere so warm that the temperature rarely reached the freezing point in mid-winter; moist and charged with the effete stable products, thereby creating the very best possible conditions for the tubercle bacillus and its diffusion among the animals. Or, second, a degree of in-breeding among some of the thoroughbred herds that in all probability impaired the powers of resistance, and rendered these animals particularly susceptible to infection.

It is a very common occurrence to find stables constructed with a deliberate purpose to retain the animal heat, without any attention to ventilation or other sanitary conditions. Under such circumstances, once infection is introduced into

the herd, even though the diseased animals are destroyed as soon as discovered, disinfection of the stables sufficient to destroy the germs is next to, if not quite, an impossibility. The remedy lies, therefore, as far as this phase of the question is concerned, in educating the farmer and stock-raiser along these lines, and to show him that the best protection he can give his herd, not only against tuberculosis, but against other diseases from which cattle occasionally suffer, lies in sanitation.

Imagine what it means when we speak of disinfecting a stable constructed in this way, with a cellar, or basement, damp in itself, never exposed to the sun, into which all the excrementitious matter of the stable is deposited. Imagine such a stable thoroughly infected with a germ which we are told lives almost indefinitely under conditions of moisture associated with nitrogenous matter, the latter of which has accumulated everywhere in the stable, not to speak of the great masses of material gathered in the cellar. Disinfection under such conditions would be only partial at the best, and might or might not protect animals introduced into such a stable, even if not for two or three years afterward. The complete eradication of the tuberculous germ from an infected stable, except through absolute abandonment for a series of years, is very improbable, especially under unsanitary conditions.

On the other hand, we believe that if particular attention were given to the sanitary construction and care of stables, the danger from the spread of the disease in a given herd, even though a tuberculous animal were in it, would be relatively small. This premises a stable in which there is sufficient cubic space per creature, with ample ventilation, light, and dryness, all of which conditions are attainable in most localities. With stables kept in a thoroughly cleanly condition, frequently swept and washed, with the addition of some disinfectant and the segregation of animals discovered to be diseased, we believe the spread of tuberculosis would be practically *nil.*

It is in this connection that we wish to present some evidence corroborative of the assertion that the disease may be arrested, based upon an experiment made by the New Hampshire cattle commissioners during the present year:

June 12, 1897, a herd of thoroughbred Holstein cattle were examined under the tuberculin test, twelve of them failing to pass. Two of these were in an advanced stage of tuberculosis, and were destroyed. Of the remaining animals, one was a thoroughbred Holstein bull, weighing over two thousand pounds, and all were under four years of age. All these animals were tested with tuberculin September 12, December 9, February 23, and on May 9 those that were living on that date were again subjected to the test.

Five of the ten animals passed the test of September 12, and five, including the bull, failed to pass. Owing to the inconvenience of keeping the bull and the supposition on the part of a few people that he was badly diseased, he was killed soon after the test in September, although there was no indication of the disease upon physical examination. The post-mortem revealed only the slightest evidences of tuberculosis.

The nine remaining animals were placed upon an isolated farm, where they were given proper sanitary care, including good ventilation, light, and moderate feed. They were kept in the open air day and night, except in stormy weather.

As a result of the test of December 9, only three of the animals reacted, and in one of these the disease was sufficiently developed to be detected by physical examination. These three animals were again tested on February 23, with no material change, and on March 29 were destroyed, the one condemned upon physical examination proving to be a well-developed case of tuberculosis. The other two killed at the same time exhibited no external evidences of the disease, and only the slightest traces were found upon a most thorough post-mortem, the condition being such as to lead to the belief that the disease was not only being reduced, but was on the way to ultimate recovery.

The six remaining animals were tested with tuberculin

February 23 and May 9, and each time passed the test successfully. Upon physical examination they appeared to be in perfect health, and a little later they were returned to the original owner, who was a cultured and wealthy business man, and who was perfectly satisfied with the result of the examination. The action of the board was, however, criticised in certain quarters, undoubtedly for special and individual purposes, and we therefore determined to destroy the animals and make a careful post-mortem examination, in order to determine whether or not our conclusions were correct. Accordingly, in August, they were killed and an autopsy made in the presence of the commissioners, a competent veterinary surgeon, and several witnesses, with the following results:

A careful autopsy was made in each case. All the internal organs were searched for evidences of disease, which were found only as stated below:

No. 1. (3190) A small encysted mass, as large as a medium-sized walnut, was found near the apex of one lung. Two of the bronchial glands were somewhat enlarged and filled with caseous matter of a thick consistency. These were the only lesions found. No evidence of recent inflammatory action or pus. All the other organs were in a healthy condition.

No. 2. (52) Two of the bronchial glands were enlarged and filled with caseous matter. On a small portion of the left lung, adjacent to the fifth rib, were found granulations, probably miliary, and which also appeared in a small patch on the ribs contiguous to the granulations on the lung. No inflammatory condition existed, and no other evidence of disease was found.

No. 3. ( ) Bronchial lymphatics slightly enlarged and containing a small amount of cheesy material, apparently encysted. No other evidence of disease.

No. 4. (366) A small nodular, encysted mass, of the size of an ordinary marble, was found in the apex of one lung. No other evidence of disease.

No. 5. (363) In one of the bronchial glands was found a

small mass of caseous matter, cylindrical in shape, about one eighth of an inch in diameter and more than an inch in length, partly calcified. No other evidence of disease.

No. 6. (362) In the upper part of one lung was found a caseous deposit, encysted, the size of a small walnut, with some calcification. In the lower part of the lung was an encysted nodule, about the size of a small cherry, containing caseous matter. No other evidence of disease.

In all the above-mentioned cases a careful examination was made of those organs most likely to be tuberculous, including lungs, liver, heart, stomach, bowels, kidneys, uterus, mammary glands, mesentery, lymphatic, and pigmentary glands,—in fact, everything except the brain and spinal cord, which it was not deemed necessary to explore.

All the cows were in an excellent condition, and probably would have passed through most, if not all, slaughtering houses without any disease being discovered, with perhaps the single exception of case No. 2, in which the granulations upon the lung, being upon the outer surface, were apparent upon the removal of that organ.

In not a single case was there any evidence of active tubercular progress; no inflammatory condition existed in any of the creatures, and no pus; neither was there any evidence of a breaking down or softening of the caseous matter of the glands. In other words, the general appearance was that of an arrested progress of a condition which at some prior time of infection had caused serious local trouble in the circumscribed localities mentioned. So excellent was the general condition of all the animals that it would have been absolutely impossible for a veterinary surgeon to discover by physical examination the least evidence of disease.

If the tubercular process was arrested, as appears to have been the case, we can see no reason why the cows might not have died of old age, had they not been slaughtered. Certainly, if the tuberculous material had become encysted, as was found to be the case, and slow calcification was taking place, it is more than probable that no serious disturbance or

further infection would have occurred from these practically isolated products and results of a former active, morbid process. This would apply to all the cases and conditions found, with the exception of the one in which the granulations existed. Whether the cell proliferation had ceased, is a question which we are unable to answer, although the appearance of the granulation was of a limited and atrophied nature, rather than of an active growth.

A similar experiment was made in 1895-'96, at the Maine Agricultural Experiment Station* with very similar results. A herd of ten cows and heifers that reacted to the tuberculin test were kept under observation, the last until October, 1897, each of them being subjected to frequent inoculations with tuberculin, and occasionally reacting.

Without giving a complete account of the treatment or a detailed report of the autopsies, it is sufficient to say that in five of the animals, or fifty per cent, the disease was held in check, so that it made practically no progress. In three others a little advancement was made, and in two cases the disease had nearly reached a fatal termination when the animals were killed.

Judging from the autopsy records, there seems to be no reason why the five animals in which the disease was arrested might not have continued in good health.

As may have been inferred from the tenor of this paper, we believe that the danger of infection from bovine tuberculosis has been greatly overrated. On this point our own views have undergone a somewhat radical change from those already on record, brought about by evidences which cannot be fully discussed at this time. We are convinced that whatever danger exists arises almost entirely, if not wholly, from those animals in which the disease is so far advanced that it may be detected by a competent veterinary surgeon upon physical examination, barring, possibly, the localized appearance of the disease in the udder, in which event the tuberculin test would determine the diagnosis.

*See Annual Report of the Station 1897.

It may be stated in this connection that the veterinary surgeons employed by us have become wonderfully expert in the physical diagnosis of tuberculosis after a little experience.

By what means those animals which we consider dangerous to the public are to be detected and destroyed, is a problem which will doubtless have to be settled differently in different sections. In our own state we believe that the dairymen and stockraisers have such a wholesome fear of their herds becoming infected that they report at once even a suspicion of the disease, and then such suspected cases are examined by the commission.

But we believe that this matter should not be left wholly to this method of detection, but that a law should be enacted providing for the registration of all dairymen—in fact, of every man who sells milk; that the state should be divided into districts, and that an inspector be appointed for each district, who should make occasional inspections under the direction of the state board of cattle commissioners, report the condition of all herds examined, and give instructions to dairymen, by circulars and otherwise, on the necessity of maintaining sanitary conditions and how to do it. The registration fee should largely, if not wholly, meet the expenses of the district inspections. Also that all slaughtered animals should be inspected before being sold. Under some such system as this we believe the disease could be reduced to very small proportions, and that, too, without extraordinary state appropriations.

In conclusion we present the following propositions:

1. That it is impossible to eradicate bovine tuberculosis; but that it may, without inflicting too great a burden upon the state, be reduced to a degree that will subserve the interests of the stockraisers, and likewise protect the public health.

2. That but a very small percentage of the animals infected with tuberculosis in any way endanger the public health, and that an indiscriminate slaughter of the cattle reacting to the tuberculin test is wholly unnecessary, inasmuch as many of them either recover or the disease is permanently arrested.

3. That a proper sanitary condition of stables and stable inclosures would do more toward preventing the spread of bovine tuberculosis than any other measure that could be adopted.

4. That the danger of infection from bovine tuberculosis may be reduced to very small proportions, if not wholly eradicated, by sanitary measures, inspections, and physical examinations by the state, in co-operation with local authorities.

5. That such inspections, once inaugurated, could be maintained without an expense that would be burdensome to the state.

FERTILIZERS.

FERTILIZERS.

FERTILIZER INSPECTION, 1897.

The Public Statutes require the secretary of the Board of Agriculture to collect samples of commercial fertilizers sold in the state and submit them to the College of Agriculture and Mechanic Arts for analysis. Licenses for the sale of commercial fertilizers are issued by the state treasurer upon the approval of the secretary of the Board of Agriculture, and the result of the annual inspection and analysis is made the basis of action in the approval of licenses. In both 1897 and 1898 the samples have been collected by Mr. James A. Foord; while the chemical analyses have been performed under the direction of the chemist of the station, Prof. Fred W. Morse, who had for assistants Messrs. Charles D. Howard, Charles W. Vickery, and Ernest B. MacCready.

In the 1897 inspection the following towns were visited by the agent of the Board of Agriculture, during the spring months, and samples taken of all brands of fertilizers to be found :

Exeter	Rockingham county
Portsmouth	Rockingham county
Hampton	Rockingham county
Wilton	Hillsborough county
Nashua	Hillsborough county
Peterborough	Hillsborough county
Keene	Cheshire county
Hinsdale	Cheshire county
Walpole	Cheshire county
Charlestown	Sullivan county
Claremont	Sullivan county
Contoocook	Merrimack county
Franklin Falls	Merrimack county
Henniker	Merrimack county

Concord	Merrimack county
Penacook	Merrimack county
Tilton	Belknap county
Lakeport	Belknap county
Laconia	Belknap county
Rochester	Strafford county
Dover	Strafford county
Madbury	Strafford county
Milton	Strafford county
Ossipee	Carroll county
Center Ossipee	Carroll county
Centerville	Carroll county
Wolfeborough	Carroll county
Plymouth	Grafton county
West Rumney	Grafton county
Haverhill	Grafton county
North Haverhill	Grafton county
Lancaster	Coös county
Colebrook	Coös county

The result was the collection of 258 samples, divided among 112 distinct brands of mixed fertilizers, representing the following manufacturers :

LIST OF MANUFACTURERS.

	Brands.
American Fertilizer Co.	3
Bowker Fertilizer Co.	11
Bradley Fertilizer Co.	10
Baugh & Sons Co.	4
Clark's Cove Fertilizer Co.	3
Cleveland Dryer Co.	2
Crocker Fertilizer and Chemical Co. (Buffalo)	4
Cumberland Bone Phosphate Co.	3
L. B. Darling Fertilizer Co.	6
John C. Dow & Co.	2
E. Frank Coe Co.	6
Great Eastern Fertilizer Co.	4
D. C. Hawes	1

Lister's Agricultural Chemical Works	4
Lowell Fertilizer Co. (Swift's)	8
Pacific Guano Co.	4
Packer's Union Fertilizer Co.	4
Parmenter & Polsey Fertilizer Co.	4
Quinnipiac Company	4
Read Fertilizer Co.	9
Russian Cement Co. (Essex)	4
Standard Fertilizer Co.	3
Henry F. Tucker Co.	1
Walker, Stratman & Co.	1
Williams & Clark Fertilizer Co.	4

Number.	Manufacturer and Brand.	Number of samples.	Nitrogen in 100 lbs.		Phosphoric acid in 100 lbs.							Potassium oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	American Fertilizer Co.												
1	General American for all crops	3	1.65	1.65	.57	5.26	8.82	14.65	9.00	5.83	6.00	2.85	2.00
2	Potato Fertilizer	1	2.47	2.47	.31	5.55	4.96	10.82	.....	5.86	6.00	8.82	9.00
3	Alkali Nitrate Phosphate for Grass and Grain	1	3.99	3.90	.....	2.05	10.55	12.60	17.00	2.05	.....	3.35	3.00
	Bowker Fertilizer Co.												
4	Bowker's Hill and Drill Phosphate	5	2.68	2.47	7.28	4.76	1.69	13.73	12.00	12.04	9.00	2.62	2.00
5	Bowker's Farm and Garden Phosphate	4	1.95	1.65	5.03	3.81	3.06	11.90	10.00	8.84	8.00	2.54	2.00
6	Bowker's Sure Crop Phosphate	2	1.06	.75	6.29	3.37	2.74	12.40	10.00	9.66	8.00	1.51	1.00
7	Bowker's Potato and Vegetable Manure	3	2.45	2.50	7.55	2.32	1.90	11.77	10.00	9.87	8.00	4.42	4.00
8	Bowker's Square Brand Bone and Potash	1	1.82	1.50	2.25	7.30	3.67	13.22	12.00	9.55	6.00	2.43	2.00
9	Bowker's Special for Corn, Grain, and Fodder Corn	1	2.25	1.75	7.38	1.88	2.04	11.30	12.00	9.26	6.00	4.36	4.25
10	Bowker's Potash Phosphate	1	.97	.75	5.40	3.81	2.72	11.93	10.00	9.21	8.00	3.65	3.00
11	Stockbridge Manure for Potatoes and Vegetables	4	3.15	3.20	6.56	1.90	1.29	9.75	7.00	8.46	5.00	10.48	10.00
12	Stockbridge Manure for Top-dressing	2	5.02	4.94	4.36	2.42	2.22	9.00	6.00	6.78	4.00	6.79	6.00
13	Stockbridge Manure for Seeding Down	1	2.24	2.25	2.70	3.76	4.82	11.28	10.00	6.46	6.00	10.14	10.00
14	Stockbridge Manure for Corn, Grain, and Fodder Corn	1	2.98	3.00	7.59	1.23	1.58	10.40	10.00	8.82	7.00	7.46	6.00

	HENRY F. TUCKER CO.												
15	Tucker's Original Bay State Bone Superphosphate	2	2.27	2.00	6.00	4.02	2.20	12.22	11.00	10.02	9.00	2.26	2.00
	BRADLEY FERTILIZER CO.												
16	Bradley's Eclipse Phosphate	5	1.93	1.00	6.18	3.38	2.24	11.80	12.00	9.56	10.00	2 13	1.50
17	Bradley's Corn Phosphate	5	2.27	2.06	6.72	2.78	2.15	11.65	10.00	9.50	9.00	1.76	1.50
18	Bradley's Potato Manure	5	2.42	2.50	4.95	2.30	1.89	9.14	8.00	7.25	6.00	5.80	5.00
19	Bradley's XL Superphosphate	5	2.58	2.50	6.29	3.60	2.44	12.33	11.00	9.89	9.00	2.33	2.00
20	Original Coe's Superphosphate	3	2 27	2.05	9.38	.13	2.49	12.00	10.00	9.51	8.00	1.70	1.00
21	Bradley's Complete Manure for Top-dressing	5	5.00	4.95	1.87	5.42	1.56	8.85	6.00	7.29	5.00	2.94	2.50
22	Bradley's Potato Fertilizer	2	2.31	2.06	5.77	3.76	3.27	12.80	11.00	9.53	9.00	3.35	3 25
23	Bradley's Complete Manure for Potatoes and Vegetables	5	3.71	3.73	5.90	2.66	2.06	10.62	9.00	8.56	8.00	6.65	6.00
24	Bradley's Complete Manure with 10 per cent Potash	1	3.19	3.30	5.45	4.12	1.66	11.23	7.00	9.57	6.00	9.90	10.00
25	Bradley's Seeding Down Manure	2	2.62	2.50	6.64	3.15	2.86	12.65	12.00	9.79	7.00	2.13	2.00
	BAUGH & SONS CO.												
26	The $25 Phosphate	1	2.40	2.06	6.95	1.85	3.53	12.33	.....	8.80	7.00	1.98	.50
27	Baugh's Special Potato Manure	1	2.10	1.65	6.43	.41	2.31	9 15	7.50	6.84	5.00	10.78	10.00
28	Baugh's General Crop Grower	1	1.36	.82	6.55	2.26	2.10	10.91	.....	8.81	8.00	2.25	1.00
29	The Economical Fertilizer	1	2.03	1.65	5.52	2.93	3.90	12.35	.....	8.45	7.00	2.67	2.00
	D. C. HAWES.												
30	Granite State Fertilizer	1	2.68	1.85	1.73	3.22	3.18	8.13	6.00	4.95	5.00	3.98	4.00
	CLARK'S COVE FERTILIZER CO.												
31	King Philip Alkaline Guano for Potatoes	1	1.37	1.23	6.02	2.52	1.53	10.07	8.00	8.54	6.50	4.18	3.00
32	Clark's Cove Potato and Tobacco Fertilizer	2	2.82	2.06	5.93	2.97	2.43	11.33	9.00	8.90	8.00	3.71	3.00
33	Clark's Cove Bay State Fertilizer	2	2.20	1.85	5.90	3.28	2.04	11.22	10.00	9.18	8.50	2.53	2.00
	CLEVELAND DRYER CO.												
34	Cleveland Superphosphate	2	2.23	2.05	5.50	3.39	2.36	11.25	11.00	8 89	9.00	2.16	2.00
35	Cleveland Potato Phosphate	3	2.28	2.05	6.58	2.96	2.75	12.29	10.00	9.54	8 00	3.50	3.00

Number.	Manufacturer and Brand.	Number of samples.	Nitrogen in 100 lbs		Phosphoric acid in 100 lbs.							Potassium oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Cumberland Bone Phosphate Co.												
36	Cumberland Potato Fertilizer	2	2.39	2.06	4.90	4.11	3.24	12.25	11.00	9.01	9.00	3.28	3.00
37	Cumberland Superphosphate	3	2.23	2.06	5.58	3.71	2.10	11.39	10.00	9.29	8.00	2.16	2.00
38	Cumberland Fertilizer	1	1.20	1.06	6.50	1.91	1.57	9.98	10.00	8.41	8.00	2.21	2.00
	Croker Fertilizer and Chemical Co.												
39	Croker's Ammoniated Corn Phosphate	5	2.01	2.00	7.53	3.14	1.21	11.88	11.00	10.67	10.00	2.04	1.60
40	Croker's Potato, Hop, and Tobacco Phosphate	5	2.25	2.00	7.67	3.09	.84	11.60	11.00	10.76	10.00	3.48	3.25
41	Croker's New Rival Ammoniated Superphosphate	5	1.25	1.23	6.75	3.20	1.28	11.23	11.00	9.95	10.00	1.97	1.60
42	Croker's Superior Rye and Oats Fertilizer	1	.93	.82	6.01	3.25	1.53	10.79	9.00	9.26	8.00	2.12	2.00
	Standard Fertilizer Co.												
43	Standard Fertilizer	1	2.12	2.00	5.58	3.79	2.12	11.49	10.00	9.37	8.00	1.95	2.00
44	Standard Guano	1	1.10	1.06	5.04	2.90	1.66	9.60	10.00	7.94	8.00	2.32	2.00
45	Standard Potato and Tobacco Fertilizer	1	2.26	2.05	5.57	4.13	2.53	12.23	9.00	9.70	8.00	3.42	3.00
	L. B. Darling Fertilizer Co.												
46	Darling's Farm Favorite	1	3.07	2.00	3.97	3.84	2.73	10.54	8.00	7.81	6.00	6.53	5.00
47	Darling's Animal Fertilizer	1	3.15	3.30	3.21	5.69	5.08	13.98	10.00	8.90	6.00	4.50	4.00
48	Darling's New Hampshire Special	4	3.19	3.00	3.46	4.55	3.34	11.35	11.00	8.01	8.00	8.00	8.00

49	Darling's Blood, Bone, and Potash	1	4.00	4.50	4.91	3.90	1.97	10.78	9.00	8.81	7.00	8.42	7.00
50	Darling's Potato and Root Crop Manure	1	2.80	2.88	3.53	4.59	5.00	13.12	10.00	8.12	7.00	9.28	7.00
121	Darling's L. I. C. Brand	1	3.67	4.00	2.49	3.67	2.90	9.06	.....	6.16	6.00	10.06	10.00
	JOHN C. DOW & CO.												
51	Dow's Nitrogenous Superphosphate for Potatoes	1	1.96	2.06	3.03	7.15	1.02	11.20	.....	10.18	8.00	4.55	4.00
52	Dow's Nitrogenous Superphosphate	1	2.42	2.06	3.15	8.91	1.94	14.00	.....	12.06	8.00	2.49	1.85
	LOWELL FERTILIZER CO.												
53	Swift's Lowell Animal Brand	2	2.41	2.46	5.45	4.13	1.46	11.04	10.00	9.58	9.00	4.34	4.00
54	Swift's Lowell Fruit and Vine Brand	1	2.41	2.47	4.94	3.58	1 44	9.96	9.00	8.52	8.00	6.35	6.00
55	Swift's Lowell Bone Fertilizer for Corn and Grain	5	2.27	1.65	4.82	2.99	1.72	9.53	9.00	7.81	8.00	3.50	3.00
56	Swift's Lowell Complete Manure for Vegetables	5	2.22	2.00	5.29	3.80	1.54	10.63	9.00	9.09	8 00	3.90	3.50
57	Swift's Lowell Empire Brand	5	1.24	1.23	3.20	3.11	1.94	8.25	8 00	6.31	7.00	2.17	2.00
58	Swift's Lowell Potato Phosphate	4	2.68	2.47	7.25	2.16	1.22	10.63	9.00	9 41	8.00	5.85	6.00
59	Swift's Lowell Lawn Dressing	1	4 60	4.12	5.00	2.48	3.52	11.00	9.00	7 48	8.00	5.36	5 00
60	Swift's Lowell Dissolved Bone and Potash	2	1.57	1.65	6.44	3.07	2.81	12.32	10.00	9.51	9.00	2.17	2.00
	E. FRANK COE CO.												
61	E. F. Coe's Celebrated Special Potato Fertilizer	1	1.77	1.65	7.74	1.78	2.94	12.46	11.00	9.52	9.00	3.80	3.50
62	E. F. Coe's High Grade Ammoniated Bone Superphosphate	3	2.11	2.00	7.61	1.95	2.45	12.01	11.00	9.56	9.00	2.07	1.85
63	E. F. Coe's Celebrated Grass and Grain Fertilizer	3	1.23	.80	8.55	1.84	3.11	13.50	10.00	10.39	9.00	2.01	1.35
64	E. F. Coe's Ground Bone and Potash	1	1.67	2.00	.....	2.78	12.40	15.18	.....	2.78	.....	3.56	2.50
65	E. F. Coe's Columbian Corn Fertilizer	2	1.48	1.20	7.60	1.40	3.66	12.66	11.00	9.00	9.00	2.00	1.85
66	E. F. Coe's Columbian Potato Fertilizer	2	1.45	1.20	7.79	1.83	3.31	12.93	11.00	9.62	9.00	1.97	1.85
	GREAT EASTERN FERTILIZER CO.												
67	Great Eastern Potato Manure	4	2.20	2.06	2.65	5.53	3.12	11.30	9.00	8.18	8.00	4.21	4.00
68	Great Eastern Grass and Oat Fertilizer	1	.....	.....	6.53	5.42	1.50	13.45	.....	11.95	11.00	2.12	2.00
69	Great Eastern General Fertilizer	3	1.34	.82	3.15	4.33	2.76	10.24	9.00	7.48	8.00	4.13	4.00
70	Great Eastern High Grade Corn Fertilizer	3	2.98	2.88	2.93	4.20	3.55	10.68	9.00	7.13	8.00	2.64	2.00

Number.	Manufacturer and Brand.	Number of samples.	Nitrogen in 100 lbs.		Phosphoric acid in 100 lbs.							Potassium oxide in 100 lbs.	
								Total.		Available.			
			Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaran-teed.	Found.	Guaran-teed.	Found.	Guaranteed.
	Lister's Agricultural Chemical Works.												
71	Lister's Special Potato Fertilizer	5	1.71	1.65	6.88	2.65	2.39	11.92	9.00	9.53	8.00	3.54	3.00
72	Lister's Success Fertilizer	5	1.50	1.24	8.46	1.66	2.52	12.64	11.50	10.12	9.50	2.20	2.00
73	Lister's Seeding Down Fertilizer	3	1.42	1.32	5.92	2.18	2.23	10.33	8.00	8.10	7.00	2.21	2.00
74	Lister's Potato Manure	1	2 39	3.70	8.77	1.18	2.20	12.15	8.50	9.95	7.50	7.65	7.00
	Packer's Union Fertilizer Co.												
76	H. G. Potato Manure	2	2.15	2.06	7.14	1.10	1.85	10.09	9.00	8.24	8.00	6.45	6.00
77	H. G. Wheat, Oats, and Clover Fertilizer	2	.....	.....	7.01	3.53	2.28	12.82	.....	10.54	11.00	1.98	2.00
78	Animal Corn Fertilizer	1	2.64	2.47	7.04	.99	1.94	9.97	9.00	8.03	8.00	2.38	2.00
79	High Grade Universal Fertilizer	1	1.08	.82	6.40	1.61	1.30	9.31	9.00	8.01	8.00	4.99	5.00
	Pacific Guano Co.												
80	Soluble Pacific Guano	5	2.20	2.25	5.77	2.82	2.74	11.33	10.50	8.59	8.50	2.03	2.00
81	Nobsque Guano	1	1.06	1.15	7.07	.37	2.29	9.73	9.00	7.44	8.00	2.52	2.00
82	Special for Potatoes and Tobacco	2	2.26	2.06	5.20	3.01	3.77	11.98	9.00	8.21	8.00	2.85	3.00
83	A No. 1 Phosphate	1	1.15	1.00	5.59	2.63	1.91	10.13	9.00	8.22	7.00	2.25	1.50
	Parmenter & Polsey Fertilizer Co.												
84	Star Brand Superphosphate	1	1.86	1.65	3.98	3.96	1.06	9.00	8.00	7.94	7.00	2.42	2.50
85	Plymouth Rock Brand	1	2.74	2.47	4.51	3.89	1.55	9.98	9.00	8.43	8.00	4.32	4.00
86	Special Potato Fertilizer	1	3.08	3.29	4.81	4.39	2.00	11.20	9.00	9.20	8.00	6.44	7.00
87	A. A. Brand Fertilizer	1	4.38	4.12	3.25	4.21	2.72	10.18	10.00	7.46	9.00	8.80	10.00

	READ FERTILIZER CO.												
88	Read's Standard Superphosphate.....	4	1.10	.82	6.41	2.11	1.23	9.75	9.00	8.52	8.00	4.09	4.00
89	Read's Sure Catch Fertilizer.....	2	.....	.....	4.34	2.32	1.18	7.84	7.00	6.66	6.00	4 50	4.00
90	Vegetable and Vine Fertilizer.....	3	1.95	1.65	5.06	1.87	1.36	8.29	7.00	6.93	6.00	8.46	8.00
91	Practical Potato Special.....	4	1.03	.82	4.58	.15	.82	5.55	5.00	4.73	4.00	8.20	8.00
92	Fish, Bone, and Potash.....	3	2.55	2.47	2 97	1.38	1.63	5.98	5 00	4.35	4.00	4.47	4.00
93	Leader Guano.....	3	1.05	.82	4.98	2.97	1.10	9.05	8.00	7.95	7.00	2.37	2.00
94	Farmers' Friend Superphosphate.....	2	2.23	2.06	7.16	2.72	1.71	11.59	10.00	9.88	9.00	2.50	2.00
95	High Grade Farmers' Friend.....	1	3.61	3.29	4.80	1.45	1.52	7.77	6.00	6.25	5.00	10.02	10.00
96	Cereal Special.....	1	1.86	1.65	4.38	2.52	1.52	8.42	7.00	6.90	6.00	4.45	4.00
	QUINNIPIAC CO.												
97	Quinnipiac Potato Phosphate.....	5	2.29	2.05	5.86	2.57	3.48	11.91	9.00	8.43	8.00	3.37	3.00
98	Quinnipiac Corn Manure.....	5	2.35	2.06	5.40	3.49	3.12	12.01	10.00	8.89	9.00	2.00	1.50
99	Quinnipiac Mohosok Fertilizer.....	1	1.21	.82	6.26	1.51	1.77	9.54	8.00	7.77	7.00	1.46	1.00
100	Quinnipiac Climax Phosphate.....	1	1.24	1.03	4.97	2.81	2.35	10.13	9.00	7.78	8.00	2.49	2.00
	RUSSIAN CEMENT CO.												
101	Essex XXX Fish and Potash.....	5	2.43	2.10	3.07	5.77	5.73	14.57	12.00	8.84	10.00	2.83	2.25
102	Essex Complete Manure for Potatoes, Roots, and Vegetables.....	3	4.34	3.70	4.19	3.66	3.03	10.88	9.00	7.85	7.00	9.05	8.50
103	Essex High Grade Superphosphate.....	1	2.81	2.50	3.32	5.83	4.70	13.85	11.00	9.15	9.00	4.98	4.00
104	Essex Complete Manure for Corn and Grass.....	1	3.90	3.70	4.38	4.44	3.30	12.12	9.50	8.82	7.00	9.98	9.50
	WALKER, STRATMAN & CO.												
105	Four-fold Fertilizer.....	3	1.38	.82	5 87	2.73	2.88	11.48	11.00	8.60	8.00	1.99	1.00
106	Potato Special Fertilizer.....	2	1.80	1.65	6.46	2.16	3.57	12.19	13.00	8.62	9.00	6.40	5.00
107	Big Bonanza Fertilizer.....	1	1.78	1.65	7.38	2.56	3.70	13.64	15.00	9.94	11.00	2.58	2.00
108	Smoky City.....	1	1.75	1.23	9.50	2.03	2.03	13.56	15.00	11.53	12.00	1.18	1.00
	WILLIAMS & CLARK FERTILIZER CO.												
109	W. & C.'s Americus Ammoniated Bone and Superphosphate.....	1	2.72	2.47	6.97	2.37	2.16	11.50	10.00	9 34	9.00	3.14	2.00
110	Prolific Crop Producer.....	1	1.07	.88	6.45	1.86	1.88	10.19	7.00	8.31	6.00	2.19	1.00
111	Americus Corn Phosphate.....	1	2.20	2.06	4.57	3.59	3.09	11.25	10.00	8.16	9.00	2.74	1.50
112	Americus Potato and Tobacco Manure...	1	2.20	2.06	6.21	2.56	3.20	11.97	9.00	8.77	8.00	4 37	3.00

COMPOSITION OF FERTILIZER CHEMICALS COLLECTED BY THE STATE BOARD OF AGRICULTURE.

	Constituents in 100 Lbs.					
	Nitrogen.	Soluble phosphoric acid.	Insoluble phosphoric acid.	Total phosphoric acid.	Available phosphoric acid.	Potash.
Bradley Fertilizer Co.						
Muriate of potash	.....	.....	.....	.....	.....	50.00
Sulphate of ammonia	20.40	.....	.....	.....	.....	.....
Fine ground bone	2.75	.....	10.90	19.40	8.50	.....
Dissolved boneblack	.....	15.60	.50	16.80	16.30	.....
Joseph Breck & Sons.						
Bone meal for poultry and lawns	2.27	.....	16.70	18 60	1.90	.....
Bowker Fertilizer Co.						
Bowker's fresh ground bone	2.75	.....	7.80	18.90	11.10	.....
Manchester Slaughtering and Rendering Co.						
Tankage	5.12	.....	8,15	17.20	9.05	.....
E. Frank Coe Co.						
Pure fine ground raw bone	3.75	.....	.....	18 35	.....	.....

TRADE VALUES OF FERTILIZING INGREDIENTS IN RAW MATERIALS AND CHEMICALS. 1897.

	Cents per pound.
Nitrogen in ammonia salts	13.5
Nitrogen in nitrates	14.0
Nitrogen in dry and fine ground fish, meat, and blood and in high-grade mixed fertilizers	14.0
Nitrogen in cottonseed meal, linseed meal, and castor pomace	12.0
Nitrogen in fine ground bone and tankage	13.5
Nitrogen in medium ground bone and tankage	11.0
Nitrogen in coarse bone and tankage	8.0
Phosphoric acid soluble in water	5.5

Phosphoric acid soluble in ammonium citrate (reverted)	5.0
Phosphoric acid in fine ground bone and tankage	5.0
Phosphoric acid in medium ground bone and tankage	4.0
Phosphoric acid in coarse bone and tankage	2.5
Phosphoric acid in fine ground fish, cottonseed meal, linseed meal, castor pomace, and wood ashes	5.0
Phosphoric acid insoluble in mixed fertilizers	2.0
Potash as sulphate free from chlorides and in wood ashes	5.0
Potash as muriate	4.5

The above values are based on the wholesale market prices for the materials, when sold in large lots at the principal trade centers in New England. The valuation of a ton of any mixed fertilizer based on the above figures will usually fall ten dollars below the retail price at the local agency. This variation includes such fixed charges as cost of mixing, bags, cartage and freight, salaries and commission of agents, and interest.

FERTILIZER NOTES FOR 1897.

BY FRED W. MORSE.

Fertilizers, during the year just ended, have been lower in price than ever before, and the indications are that they will be even cheaper during the year to come. The result of the cheapening of the chemical constituents has been to raise the quality of the mixed fertilizers somewhat above the minimum guarantee, and consequently there are very few samples showing deficits in their composition. Out of four hundred forty-eight separate guarantees, only twenty-eight failed to either exceed the requirements or come within the limits of error in sampling and analyzing. These exceptions included five guarantees of nitrogen, seven of total phosphoric acid, fourteen of available phosphoric acid, and two of potash, and were scattered through twenty-four distinct brands representing

eighteen different manufacturers, thus indicating that there was no attempt at fraud, but either slight carelessness or accident in mixing and bagging the materials. In no case would the guaranteed value have been noticeably affected.

A study of the tabulated analyses has shown a few points that are of importance to the user of ready-mixed chemical fertilizers.

One hundred and twelve different brands of mixed fertilizers are included in the tables. Of these, fifty-six brands are not guaranteed to contain more than 2 per cent of nitrogen, and fifty-one brands more than 2 per cent of potash. Only fifteen brands are claimed to contain more than 3 per cent of nitrogen and but seventeen brands to contain more than 6 per cent of potash. On the other hand seventy-three brands are claimed to contain more than 8 per cent of available phosphoric acid.

It may thus be easily seen that the average buyer of fertilizers is purchasing regularly about four times as much phosphoric acid as nitrogen and from two to four times as much phosphoric acid as potash. The persistent use of the average fertilizer must then result in an accumulation of useless phosphoric acid in the soil, accompanied by an exhaustion of the soil's available nitrogen and potash, and in diminishing crops. On most of our New Hampshire soils such a fertilizer will need to be employed in conjunction with barnyard manure, to be economical, since the manure will supply the nitrogen and potash which the fertilizer lacks.

Thirty-one brands are not warranted to contain more than 1.5 per cent of nitrogen, and have been prepared and placed on the market because of the demand for cheap fertilizers. Nitrogen is the most expensive ingredient of a fertilizer, costing about three times as much as either potash or available phosphoric acid, and is invariably the constituent to be lowered in a mixed fertilizer in order to reduce the price.

It is only in exceptional soils, such as new ground or land previously heavily manured, that crops will receive nitrogen sufficient for successful growth when such low-grade fertilizers

are applied. Several letters have been received during the past year testifying to the disappointment liable to be incurred by the users of fertilizers containing small proportions of active nitrogen.

The buyers of ready-mixed fertilizers should bear in mind that it is as important that they study the composition of the fertilizers as that the station chemist does. In the latter case it is essential to know merely that the analyses and guarantees are alike, while in the former case it is necessary to know that the composition is suitable for the uses intended. The name of a brand is no indication that it is suitable for a special crop. Hardly two manufacturers agree in their special fertilizers for corn and similar crops, while some companies issue not less than three distinct mixtures each for such a crop as potatoes.

It should also be remembered that there is no "best fertilizer" made, but each farmer may by careful observation determine those brands which serve his purpose best, and he should know them by their composition, instead of simply by name or price. A comparison of the constituents of any ten fertilizers reported in the foregoing table should convince the user of commercial fertilizers that they cannot be bought haphazard and return a profit to the buyer. The user must try to find out the class of mixture that he needs and thus avoid purchasing unnecessary ingredients while failing to secure necessary ones.

PUBLIC STATUTES OF NEW HAMPSHIRE.

CHAPTER 126.

FERTILIZERS.

Section 20. Every person manufacturing or importing fertilizers to be sold or offered for sale within this state shall obtain a license from the state treasurer, countersigned and recorded by the secretary of the Board of Agriculture, author-

izing such sale. The license shall be for one year, and the party to whom it is granted shall pay therefor fifty dollars, for the use of the state.

SECT. 21. Every such person shall cause to be affixed to every bag, barrel, or parcel of fertilizer to be sold or offered for sale within this state, a written or printed label which shall correctly state his name, his place of business, the number and date of his license, the name of the fertilizer, the date of its manufacture, the percentage of ammonia, nitrogen, soluble phosphoric acid, insoluble phosphoric acid, potash, and its other constituent parts, and the words, "State of New Hampshire—Licensed." By the term "soluble phosphoric acid" is meant such acid in any form or combination when readily soluble in pure water; and by "insoluble phosphoric acid," such as requires the action of acid to render it thus soluble.

SECT. 22. Any manufacturer or importer of fertilizers for sale within this state who does not obtain a license authorizing such sale, or affix to the bags, barrels, or parcels of fertilizers to be sold or offered for sale in this state a label containing the information required by the preceding section, or who affixes a label to such packages containig false information as to any of said particulars, shall forfeit five hundred dollars for each offense, one half for the use of the prosecutor, and the other half for the use of the state.

SECT. 23. Any person who sells or keeps for sale any fertilizer not labeled as required by section 21 of this chapter, or which has a label affixed thereto giving false information as to any of said particulars, or the sale of which is not duly licensed, shall be fined twenty dollars for the first offense and forty dollars for each subsequent offense, one half for the use of the prosecutor, and the other half for the use of the state.

SECT. 24. The money received for license fees by virtue of section 20 of this chapter is appropriated for the following purposes: A sufficient sum to pay the College of Agriculture and the Mechanic Arts the actual expenses of making analyses of fertilizers and other substances submitted to the

college by the Board of Agriculture for analysis, and the balance thereof to pay the expenses of farmers' meetings held in winter months under the authority of the Board of Agriculture.

CHAPTER 12.—SECTION 9.

STATE BOARD OF AGRICULTURE.—DUTIES OF SECRETARY.

Line 11. He shall collect samples of fertilizers sold in this state, and any other articles which the interests of agriculture may require, and submit them to the College of Agriculture and the Mechanic Arts for chemical analysis.

FERTILIZER INSPECTION, 1898.

The same general plan was followed in 1898 as in 1897 in the inspection and analysis of fertilizers, except that not so many analyses were made. The samples were collected in a similar manner and by the same agent as in 1897, and the analyses made at the experiment station as before. The result of this inspection was the collection of ninety-seven samples, representing twenty-four fertilizer companies. Samples of sixty-four brands were analyzed, while the remaining thirty-three samples are held subject to analysis in the case of any question that requires it. The result of the analyses made was as follows:

COMPOSITION OF COMMERCIAL FERTILIZERS ANALYZED, 1898.

Analytical number.	Manufacturer and Brand.	Nitrogen.		Phosphoric acid.							Potash.	
							Available.		Total.			
		Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Baugh & Sons Co.											
1	General Crop Grower	1.12	.82	5.68	3.27	1.15	8.95	8.00	10.10	.....	1.49	1.00
2	Special Potato Manure	1.67	1.65	4.72	1.83	1.84	6.55	5.00	8.39	7.50	9.53	10.00
3	Economical Fertilizer	2.10	1.65	5.05	3.17	3.34	8.22	7.00	11.56	.....	2.28	2.00
4	Twenty-five Dollar Phosphate	2.35	2.06	5.69	3.50	2.71	9.19	7.00	11.90	.....	.90	.50
	Bowker Fertilizer Co.											
5	Blood, Bone, and Potash	3.92	4.00	3.56	4.29	4.15	7.85	8.00	12.00	12.00	7.41	7.00
6	Granite State Fertilizer	1.88	1.00	4.57	2.66	3.66	7.23	7.00	10.89	10.00	7.03	6.00
7	Potato and Vegetable Phosphate	1.61	1.50	5.87	2.42	2.94	8.29	8.00	11.23	10.00	2.32	2.00
8	Stockbridge Manure for Corn, Grain, and Fodder Corn	3.08	3.00	5.63	2.44	2.96	8.07	7.00	11.03	10.00	7.81	7.00
9	Special Fertilizer for Potatoes and Vegetables	2.24	2.25	6.72	2.47	1.34	9.19	8.00	10.53	10.00	4.63	4.00
60	Hill and Drill Phosphate	2.15	2.25	6.63	2.54	3.48	9.17	9.00	12.65	12.00	2.57	2.00
	Bradley Fertilizer Co.											
10	Eclipse Phosphate	1.65	1.00	5.63	3.63	3.10	9.26	9.00	12.36	10.00	1.77	1.50
11	Grass Manure for Top-dressing	4.04	3.91	4.03	1.20	1.08	5.23	5.00	6.31	6.00	2.50	2.00
12	Seeding-down Manure	2.59	2.50	6.59	3.44	1.97	10.03	7.00	12.00	12.00	2.36	2.00
13	Original Coe's Superphosphate	2.13	2.05	5.44	3.53	2.76	8.97	8.00	11.73	10.00	1.78	1.00
14	English Lawn Fertilizer	4.50	4.95	2.94	3.62	1.64	6.56	5.00	8.20	6.00	3.26	2.50
15	Complete Manure for Potatoes and Vegetables	3.50	3.30	3.45	4.69	2.99	8.14	8.00	11.13	9 00	7.17	7.00
16	Complete Manure for Corn and Grain	3.37	3.30	5.31	6.13	2.40	11.44	12.00	13.84	13.00	3.15	3.00

	CLARK'S COVE FERTILIZER CO.											
17	King Philip Alkaline Guano	1.12	1.00	6.10	3.96	1.80	10.06	8.00	11.86	9.00	2.60	2.00
	CLEVELAND DRYER CO.											
18	Cleveland Superphosphate	2.14	2.05	5.88	3.36	2.78	9.24	9.00	12.02	11.00	2.01	2.00
	CROCKER FERTILIZER & CHEMICAL CO.											
61	Potato, Hop, and Tobacco Phosphate	2.12	2.00	8.20	1.73	1.22	9.93	10.00	11.15	11.00	4.07	3.25
	CUMBERLAND BONE PHOSPHATE CO.											
64	Potato Fertilizer	1.92	2.06	6.57	2.46	3.22	9.03	9.00	12.25	11.00	2.95	3.00
	L. B. DARLING FERTILIZER CO.											
19	New Hampshire Special	3.59	3.00	4.52	4.57	.92	9.09	8.00	10.01	10.00	8.45	8.00
20	Special L. I. C. Brand	4.20	4.50	2.70	2.71	3.84	5.41	7.00	9.25	8.00	10.15	10.00
	E. FRANK COE CO.											
21	Prize Brand Grain and Grass Fertilizer	.56	.40	6.52	4.18	3.96	10.70	10.50	14.66	12.00	1.85	1.25
22	Celebrated Special Potato Fertilizer	1.62	1.65	6.40	2.19	2.94	8.59	8.00	11.53	10.00	4.15	4.00
23	Columbian Bone Superphosphate	1.49	1.20	7.42	2.45	3.12	9.87	9.00	12.99	11.00	2.45	1.85
	GREAT EASTERN FERTILIZER CO.											
24	Northern Corn Special	3.13	2.88	.77	7.20	1.87	7.97	8.00	9.84	9.00	2.80	2.00
25	General Fertilizer	1.07	.82	.64	7.19	1.85	7.83	8.00	9.68	9.00	4.95	4.00
	LAVERY FERTILIZER CO.											
26	Lavery's Superphosphate	2.45	1.95	1.54	8.60	1.12	10.14	10.00	11.26	.....	.56	2.35
	LOWELL FERTILIZER CO. (SWIFT'S).											
27	Potato Phosphate	2.75	2.47	6.09	1.80	1.83	7.89	8.00	9.72	9.00	6.33	6.00
28	Bone Fertilizer for Corn and Grain	1.84	1.65	6.17	1.89	1.82	8.06	8.00	9.88	9.00	3 30	3.05
29	Fruit and Vine for Strawberries	3.54	3.29	6.71	2.69	1.26	9.40	8.00	10.66	9.00	5.58	6.00
30	Market Garden Manure	3.70	4.10	5.50	1.75	1.70	7.25	7.00	8.95	8.00	5.55	5.50
31	Animal Brand for General Use	2.53	2.46	7.67	1.48	2.06	9.15	9.00	11.21	10.00	5.72	4.00

COMPOSITION OF COMMERCIAL FERTILIZERS, 1898.— *Continued.*

Analytical number.	Manufacturer and Brand.	Nitrogen.		Phosphoric acid.							Potash.	
							Available.		Total.			
		Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Lowell Fertilizer Co.— *Continued.*											
33	Lawn Dressing	3.29	4.11	5.47	3.44	2.64	8.91	7.00	11.55	8.00	5 93	5.00
59	Dissolved Bone with Potash	1.85	1.65	5.53	4.10	2.10	9.63	9.00	11.73	10.00	2.61	2.00
	Lister's Agricultural Chemical Works.											
62	Special Potato Fertilizer	1.77	1.65	6.87	1.54	2.72	8.41	8.00	11.13	9.00	3.28	3.00
	Pacific Guano Co.											
37	Potato Special	1.95	2.06	4.36	4.52	2.34	8.88	8.00	11.22	9.00	3.30	3.00
	Packers' Union Fertilizer Co.											
35	High Grade Wheat, Oats, and Clover Fertilizer	.....	.....	6.39	6.29	2 30	12.68	11.00	14.98	.....	1.94	2.00
36	High Grade Gardener's Complete Manure	2.59	2.47	6.00	3.55	1.30	9.55	8.00	10.85	10.00	8.65	10.00
	Parmenter & Polsey Fertilizer Co.											
65	Plymouth Rock Brand	2.89	2.47	2 54	6.17	2.32	8.71	8.00	11.03	9.00	4.18	4.00
	Quinnipiac Co.											
63	Quinnipiac Potato Phosphate	2.54	2.05	7.00	1.93	3.03	8.93	8.00	11.96	9.00	3.21	3.00

	READ FERTILIZER CO.											
40	High Grade Farmers' Friend	3.18	3.25	3.63	1.05	2.50	4.68	5.00	7.18	6.00	10.63	10.00
41	Sure Catch Fertilizer			2.95	4.59	.64	7.54	6.00	8.18	7.00	4.23	4.00
42	Farmers' Friend Superphosphate	2.26	2 00	7.54	2.07	2.06	9.61	9.00	11.67	10.00	2.65	2.00
43	Samson Fertilizer for Potatoes	1.86	1.65	4.27	2.07	1.78	6 34	6.00	8.12	7.00	4.74	4.00
44	Original Alkaline Bone			4.67	5.21	1 37	9.88	10.00	11.25	11.00	2.35	3.00
	RUSSIAN CEMENT CO. (ESSEX).											
45	XXX Fish and Potash	2.62	2.10	5.17	3.70	5.27	8.87	10.00	14 14	12.00	2.39	2.25
46	Complete Manure for Corn, Grain, and Grass	4.04	3.70	4.93	2.09	4.25	7.02	7.00	11.27	9.50	10.02	9.50
47	Complete Manure for Potatoes and Vegetables	3.72	3.70	5.36	2.25	4.06	7.61	7.00	11.67	9.00	9.29	8.50
	HENRY F. TUCKER CO.											
48	Imperial Bone Superphosphate	1.17	1.25	6.16	1.90	2.12	8.06	9.00	10.18	11.00	2.47	1 85
49	Special Potato Fertilizer	2.05	2.06	2.37	3.20	4.05	5.57	8.00	9.62	9.00	5.70	6.00
50	Grass Manure	5.21	3.91	4.45	.85	2.60	5.30	5.00	7.90	6.00	2.90	2.00
	STANDARD FERTILIZER CO.											
51	Standard Special for Potatoes	2.06	2.05	5.96	2.07	2.94	8.03	8.00	10.97	9.00	3.34	3.00
	WILLIAMS & CLARK FERTILIZER CO.											
52	Americus Corn Phosphate	2.10	2.06	5.25	3.89	3.24	9.14	9.00	12.38	10.00	1.94	1.50
53	Americus Potato Manure	2.06	2.06	5.90	2.66	3.32	8.56	8.00	11 88	9.00	3.14	3.00
54	Prolific Crop Producer	1.12	.82	3.83	2.06	4.54	5.89	6.00	10.43	7.00	1.47	1.00
	ARMOUR FERTILIZER WORKS.											
55	All soluble	3.02	2.88	4.85	2.72	3.05	7.57	8.00	10.62	10.00	5 98	4 00
56	Ammoniated Bone with Potash	3.55	2.47	4.56	1.67	6.21	6.23	6.00	12.44	8.00	2.77	2 00
57	Grain Grower	2.94	1.64	5.80	2.15	4.91	7.95	8.00	12.86	10.00	2.66	2.00

LIST OF FERTILIZERS SAMPLED BUT NOT ANALYZED, 1898.

Manufacturer and Brand.	Guaranteed composition.			
	Nitrogen.	Phosphoric acid.		Potash.
		Available.	Total.	
Bowker Fertilizer Co.				
Stockbridge Manure for Potatoes and Vegetables	3.20	5.00	7.00	10.00
Stockbridge Manure for Top-dressing	4.75	4.00	6.00	6.00
Square Brand Bone and Potash	1.50	6.00	12.00	2.00
Sure Crop Phosphate	.83	8.00	10.00	1.00
Bradley Fertilizer Co.				
XL Superphosphate	2.50	9.00	11.00	2.00
Corn Phosphate	2.66	9.00	10.00	1.50
Potato Manure	2.50	6.00	8.00	5.00
Clark's Cove Fertilizer Co.				
Potato Fertilizer	2.00	8.00	9.00	3.00
Cleveland Dryer Co.				
Potato Phosphate	2.05	8.00	10.00	3.00
Crocker Fertilizer and Chemical Co.				
New Rival Ammoniated Superphosphate	1.23	10.00	11.00	1.60
Ammoniated Corn Phosphate	2.00	10.00	11.00	1.60

E. Frank Coe Co.				
Columbian Corn Fertilizer	1.00	9.00	11.00	1.85
Columbian Potato Fertilizer	1.00	9.00	11.00	1.85
Special Grass and Grain Fertilizer	.80	9.00	10.00	1.35
High Grade Ammoniated Bone Superphosphate	2.00	9.00	11.00	1.85
L. B. Darling Fertilizer Co.				
Potato and Root Crop Manure	2.88	9.00	10.00	7.00
Animal Fertilizer	3.30	6.00	10.00	4.00
Great Eastern Fertilizer Co.				
Grass and Oats Fertilizer		11.00	12.00	2.00
Potato Manure	2.06	8.00	9.00	4.00
Lister's Agricultural Chemical Works.				
Lister's Success Fertilizer	1.24	9.50	11.50	2.00
Pacific Guano Co.				
Soluble Pacific Guano	2.25	8.50	10.50	2.00
Packers' Union Fertilizer Co.				
High Grade Animal Corn Fertilizer	2.47	8.00	9.00	2.00
High Grade Universal Fertilizer	.82	8.00	9.00	5.00
Quinnipiac Co.				
Quinnipiac Corn Manure	2.06	9.00	10.00	1.50
Quinnipiac Climax Phosphate	1.03	8.00	9.00	2.00
Read Fertilizer Co.				
Standard Superphosphate	.83	8.00	9.00	4.00
Practical Potato Special	.83	4.00	5.00	8.00
Vegetable and Vine Fertilizer	1.65	6.00	7.00	8.00
Leader Guano	.83	7.00	8.00	2.00
Fish, Bone, and Potash	2.50	4.00	5.00	4.00

LIST OF FERTILIZERS SAMPLED BUT NOT ANALYZED, 1898.— *Continued.*

Manufacturer and Brand.	Guaranteed composition.			
	Nitrogen.	Phosphoric acid.		Potash.
		Available.	Total.	
Standard Fertilizer Co.				
Standard Fertilizer.....	2.00	8.00	10.00	2.00
Henry F. Tucker Co.				
Original Bay State Bone Phosphate.....	2.06	9.00	11.00	2.00
D. C. Hawes.				
Granite State Fertilizer.....	2.25	5.00	6.00	4.00

COMPOSITION OF FERTILIZER CHEMICALS, ANALYZED FOR THE STATE BOARD OF AGRICULTURE, 1898.

Analytical number.	Manufacturer and Brand.	Nitrogen.		Phosphoric acid.							Potash.	
							Available.		Total.			
		Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	Lowell Fertilizer Co. (Swift's).											
32	Ground Bone	1.97	2.47	.....	10.40	18.80	10.40	.....	29.20	23.00	.....	.....
	Manchester Slaughtering and Rendering Co.											
34	Tankage	5.00	.....	.....	6.07	12.57	6.07	.....	18.64	.....	.....	.....
	Parmenter & Polsey Fertilizer Co.											
38	Dissolved Bone	1.60	1.65	2.29	14.18	4.80	16.47	15.00	21.27	20.00	.....	.....
39	Muriate of Potash	.....	.....	.....	.....	.....	.....	.....	.....	.....	50.38	50.00

STATE HORTICULTURAL SOCIETY.

1898.

Hon. N. J. Bachelder, Secretary Board of Agriculture, Concord, N. H.:

SIR,—Herewith I have the honor to present you for publication the fifth annual report of the New Hampshire Horticultural Society.

Yours respectfully,
W. D. BAKER,
Secretary.

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REPORT.

The society was organized in December, 1893, and after a year of prosperity was reorganized as a state society and granted an appropriation of three hundred dollars per year by the legislature.

This sum, while far from adequate for the work required of the society in the various parts of the state, yet with the aid of friends of the cause enabled the society to hold an annual exhibit in each of the two following years, and also several institutes in different sections. The last legislature, however, failed for some reason to make the appropriation permanent (the bill failing of passage in the senate after it had been approved by the house), and the society being without endowment or permanent funds was compelled to rely upon its officers and members to carry on the work during the past two years.

Of course, being without the state aid, it was not possible to carry out the society's work to any great extent, but our annual exhibits have been held in connection with the New Hampshire State Grange Fair at Tilton, and during the past year we have in addition held a "Strawberry Day," through the kind invitation of Mr. George F. Beede of Fremont, at his grounds in that town, June 25, at which quite a large number were present and addresses were made by President C. C. Shaw, Prof. F. W. Rane of the Agricultural College, Capt. E. M. Shaw of Nashua, and others, and all enjoyed sampling the fine strawberries grown by Mr. Beede, who was testing about one hundred fifty varieties. Through the courtesy of the managers of the Grange Fair, one session was given for the horticultural work, and a most interesting meeting

was held on the second day of the fair, at which addresses were delivered by Hon. Charles Pope of Manchester, Maine, treasurer of the Maine State Pomological Society; Prof. Charles W. Burkett and Prof. F. W. Rane, of the Agricultural College; President C. C. Shaw, and others.

The society has had many requests from different sections of the state to hold institute meetings, especially at the instance of the local grangers, but lack of funds to defray expenses of speakers has prevented anything farther than individual efforts in a few instances.

There is possibly no field where so great improvement is possible as in fruit culture in our state. Our soil, climate, and proximity to market give us exceptional advantages, and with suitable aid from the state, such as is given by Maine and all other fruit growing states, the New Hampshire Horticultural Society can be the means of encouraging and developing our fruit interests to the same extent that the Granite State Dairymen's Association has the dairy interests of the state.

NEW HAMPSHIRE STATE GRANGE

1898.

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181. Sandown, Sandown.—Alva S. Sanborn, Master; Elwin C. Mills, Lecturer; Mrs. Celia M. Colby, Secretary.
182. Windham, Windham.—Albert W. Farmer, Master; Mrs. Margaret J. H. Smith, Lecturer; Mrs. Mary F. Anderson, Secretary.
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187. Danville, Danville.—Willis C. Tuck, Master; Alfred B. Sargent, Lecturer; Fred C. Quimby, Secretary.
188. Rumney, Rumney.—C. C. Smart, Master; Mrs. Susie C. Atwood, Lecturer; G. P. Cook, Secretary.
189. Bow, Bow.—D. Waldo White, Master; Mrs. Nellie J. Bloomfield, Lecturer; Miss Ethel G. Watson, Secretary.
190. Sugar River, North Charlestown.—Sumner F. Gay, Master; Mrs. Helen W. Jenney, Lecturer; Miss Alice B. Perry, Secretary.
191. Sunset, Madison.—J. F. Chick, Master; David Knowles, Lecturer; Mrs. Jennie P. Forrest, Secretary.
192. M. L. Ware, West Rindge.—S. Warren Kimball, Master; Mrs. Lizzie S. Wetherbee, Lecturer; Mrs. Alta M. Whitney, Secretary.
193. Lewis W. Nute, Milton.—Charles H. Cole, Master; Myron P. Dickey, Lecturer; Leroy F. Corson, Secretary.
194. Hiram R. Roberts, Rollinsford.—Fred Plumer, Master; George H. Yeaton, Lecturer; Charles E. Hayes, Secretary.
195. Greenland, Greenland.
196. Silver Mountain, Lempster.—Wallace W. Hall, Master; Mrs. L. May Wheeler, Lecturer; Miss Cora T. Sabine, Secretary.
197. Moultonborough, Moultonborough.—Edgar S. Goss, Master; Mrs. Lucy E. Lee, Lecturer; Mrs. Carrie M. Moulton, Secretary.
198. Winnesquam, East Tilton.—Charles Herbert Foss, Master; Mrs. Kate A. Gilman, Lecturer; Fred A. Currier, Secretary.
199. Wentworth, Wentworth.—Cyrus Downing, Master; Miss J. M. Davis, Lecturer; John B. Foster, Secretary.
200. Warren, Warren.—Alonzo F. Bartlett, Master; Mrs. Anna Perry, Lecturer; Miss Lela Lee Whitcher, Secretary.
201. Cherry Mountain, Carroll.—Charles S. Miles, Master; Mrs. Flora J. Miles, Lecturer; Mrs. M. F. Brown, Secretary.
202. Green Mountain, Effingham.—George A. Meloon, Master; Mrs. Augusta S. Meloon, Lecturer; Miss Sarah A. Leighton, Secretary.
203. Bethlehem, Bethlehem.—A. W. Nourse, Master; Mrs. Nellie A. McIntire, Lecturer; Fred N. Howland, Secretary.
204. Charlestown, Charlestown.—Lyman B. Eaton, Master; Miss Grace E. Hunt, Lecturer; Mrs. H. E. Corbin, Secretary.

205. Henry Wilson, Farmington.—Fred A. Horne, Master; Mrs. Lucy A. Perkins, Lecturer; David Tufts, Secretary.
206. Garnet Hill, Center Harbor.—Daniel W. Coe, Master; Mrs. Delia Kelley, Lecturer; Miss Edith Kelley, Secretary.
207. Bennington, Bennington.—Ruel S. Cram, Master; Mrs. Lizzie M. Holt, Lecturer; Mrs. Annie L. Woodbridge, Secretary.
208. Lafayette, Franconia.—Mrs. Lydia E. Gould, Master; Mrs. Mary Clark, Lecturer; W. J. Young, Secretary.
209. Northwood, Northwood Narrows.—Albion R. Hyde, Master; Mrs. Annie Fitts, Lecturer; Miss Alice E. Small, Secretary.
210. Pink Granite, North Haverhill.—P. W. Allen, Master; Charles A. Gale, Lecturer; A. R. Kendall, Secretary.
211. Brookline, Brookline.—William J. Bailey, Master; Miss Mamie E. Rockwood, Lecturer; Mrs. Clara E. Russell, Secretary.
212. Haverhill, Haverhill.—W. O. Burbeck, Master; Mrs. Kate C. Cass, Lecturer; Mrs. N. Della Carbee, Secretary.
213. Raymond, Raymond.—James M. Healey, Master; Mrs. Agnes S. Rowell, Lecturer; Mrs. Ella W. Elliott, Secretary.
214. Moosilauke, East Haverhill.—Ernest W. Jeffers, Master; James M. Jeffers, Lecturer; Olin True, Secretary.
215. Mountain Laurel, Northwood.—Samuel W. Gerrish, Master; Eben L. Poore, Lecturer; Mrs. Arabella H. Thompson, Secretary.
216. Contoocook, Contoocook.—Charles R. Putnam, Master; Mrs. Bertha L. O. Tasker, Lecturer; Mrs. Annie E. Hardon, Secretary.
217. Mohawk, Colebrook.—S. B. Whittemore, Master; Mrs. Emeline C. Whittemore, Secretary; Ransom Harriman, Secretary.
218. Mt. Gardner, Woodsville.—S. M. Chamberlin, Master; Mrs. Nellie E. Deming, Lecturer; John G. Marston, Secretary.
219. Piermont, Piermont.—Albert Bowles, Master; Mrs. Martha Reneau, Lecturer; Miss Addie L. Curtis, Secretary.
220. Mascot, Gorham.—Thomas W. Haley, Master; Miss Effie M. Wood, Lecturer; Miss Lena L. Lowe, Secretary.
221. Lake, Sunapee.—George Dodge, Master; Mrs. L. A. B. Dodge, Lecturer; Mrs. Mary E. George, Secretary.
222. Sugar Hill, Sugar Hill.—Fred H. Bowles, Master; Mrs. Lizzie Bowles, Lecturer; Mrs. Ardelle Bowles, Secretary.
223. Colebrook, Colebrook.—Charles F. Wiggin, Master; James I. Parsons, Lecturer; William T. Phillips, Secretary.

224. Columbia, Columbia.—E. George Rogers, Master; Mrs. Arabell C. Rogers, Lecturer; William H. Annis, Secretary.
225. Dover, Dover.—Channing Folsom, Master; Mrs. Carrie A. Twombly, Lecturer; Charles W. Twombly, Secretary.
226. Frontier, West Stewartstown.—Lorenzo Farnham, Master; Hiram A. Schoff, Lecturer; James Brooks, Secretary.
227. Eden, West Milan.—Joseph W. Nay, Master; Mary E. Nay, Lecturer; George A. Fogg, Secretary.
228. Androscoggin, Milan.—T. P. Dustin, Master; Miss Alice Martin, Lecturer; Miss Bertha M. Taylor, Secretary.
229. Pilot, Stark.—James Montgomery, Master; Mrs. Etta M. Cole, Lecturer; Mrs. Frances L. Cole, Secretary.
230. Unity, Unity.—Benjamin F. French, Master; Mrs. Mary C. Burt, Lecturer; Emeline E. Jacobs, Secretary.
231. Umbagog, Errol.—Remember B. Thurston, Master; Mrs. Lottie Thurston, Lecturer; Dwight C. Thurston, Secretary.
232. Blue Mountain, Grantham.—Imla S. Brown, Master; Mrs. Carrie H. Buswell, Lecturer; George A. Tyrrel, Secretary.
233. Rye, Rye.—Fred D. Parsons, Master; Mrs. Ella F. Foss, Lecturer; Miss Annie K. Sawyer, Secretary.
234. Blow-Me-Down, Plainfield.—Daniel C. Westgate, Master; Henry C. Daniels, Lecturer; Mrs. Julia A. Burr, Secretary.
235. Aurora, Pittsburg.—David Blanchard, Master; Lois Bracket, Lecturer; Sylvester Lyford, Secretary.
236. Mount Cube, Orfordville.—George N. Russel, Master; Mrs. Lewis Franklin, Lecturer; Mrs. E. W. Cushman, Secretary.
237. Lyman, Lyman.—Wilmer Langway, Master; Mrs. Agnes E. Sherman, Lecturer; David H. Miner, Secretary.
238. Stratford, Stratford.—A. L. Wheeler, Master; George L. Dexter, Lecturer; Eugene L. Harvey, Secretary.
239. Plymouth, Plymouth.—L. D. Fogg, Master; Miss Lydia L. Smith, Lecturer; Herbert M. Merrill, Secretary.
240. Lamprey River, Newmarket.—Albert E. Stevens, Master; Mrs. Cornelia E. Haines, Lecturer; Ernest P. Pinkham, Secretary.
241. Naumkeag, Litchfield.—Amos Saunders, Master; Mrs. Mary B. Center, Lecturer; Miss Mary W. Taggart, Secretary.
242. Mount Prospect, Lancaster.—Charles E. Howe, Master; Mrs. Selden C. Howe, Lecturer; L. R. Hosmer, Secretary.
243. Winthrop, Shelburne.—James Simpson, Master; Miss Carrie M. Evans, Lecturer; Horace G. Green, Secretary.
244. Pelham, Pelham.—George S. Butler, Master; Mrs. Estelle F. Hyde, Lecturer; Miss Mary E. Hobbs, Secretary.

245. Jewel, Columbia.—George W. Rowell, Master; Herbert P. Locke, Lecturer; William E. Cone, Secretary.
246. Mount Duston, Wentworth's Location.—M. D. Sturtevant, Master; Mrs. Josephine Littlehale, Lecturer; Mrs. Delia Leavett, Secretary.
247. Clarksville, Clarksville.—Willis A. Harriman, Master; Mrs. Sarah J. Felton, Lecturer; Irving G. Young, Secretary.
248. The Weirs, The Weirs.—David B. Story, Master; Mrs. Lydia E. Warner, Lecturer; Mrs. W. J. Morrison, Secretary.
249. Park, Cornish Flat.—John S. Andrews, Master; Edwin L. Child, Lecturer; Mrs. Lucy C. Weld, Secretary.
250. North Hampton, North Hampton.—Albert E. Locke, Master; Mrs. Frank T. Brown, Lecturer; Miss Annie B. Smith, Secretary.
251. Strawberry Bank, Portsmouth.—James E. Foote, Master; Robert Patterson, Lecturer; Miss Miriam Schurman, Secretary.
252. Dustin Island, Penacook.—Almon G. Harris, Master; Arthur L. Parker, Lecturer; John C. Farrand, Secretary.
253. West Thornton, Thornton.—John F. Merrill, Master; Miss Gertrude E. Kendall, Lecturer; Fred W. Downing, Secretary.
254. Cape Horn, Northumberland.—F. N. Piper, Master; Richard Brattie, Lecturer; George A. Hubbard, Secretary.
255. Groveton, Groveton.—Charles Cummings Howe, Master; Mrs. Lucy D. Moody, Lecturer; Miss Mary Tibbetts, Secretary.
256. Coos, North Stratford.—Beaman A. Bowker, Master; Mrs. Sadie Hutchins, Lecturer; Mrs. Henry Fuller, Secretary.
257. Prentice Hill, East Alstead.—George A. Mayo, Master; Mrs. Sarah J. Fish, Lecturer; Mrs. Nettie M. Gates, Secretary.
258. Squam Lake, Ashland.—Thomas P. Cheney, Master; Mrs. Addie S. Hughes, Lecturer; Miss Clara A. Perkins, Secretary.
259. Profile, North Woodstock.—W. L. E. Hunt, Master; Mrs. G. E. Emery, Lecturer; F. D. Morey, Secretary.
260. Ocean Side, Hampton.—Frank B. Brown, Master; Luchion W. Cook, Lecturer; Christopher S. Toppan, Secretary.
261. Mount Kinsman, Easton.—Alfred T. Young, Master; Mrs. Mary Young, Lecturer; Mrs. Ada S. Aldrich, Secretary.
262. New Durham, New Durham.—F. W. Coburn, Jr., Master; Mrs. Sarah E. Coburn, Lecturer; George F. Rohan, Secretary.

263. Nubaunsit, Harrisville.—James Pierce, Master; Miss Julia E. Pierce, Lecturer; Miss Belle Hutchinson, Secretary.

264. Somersworth, Somersworth.—Benjamin F. Hanson, Master; Mrs. Alberton B. Seavey, Lecturer; George H. Clark, Secretary.

265. Banner, East Rochester.—Frank W. Corson, Master; Frank Walsh, Lecturer; Albert L. Richards, Secretary.

266. Pasquaney, Bridgewater.—C. H. Marston, Master; Mrs. Annette Sawyer, Lecturer; Mrs. Flora D. Snow, Secretary.

267. Cardigan, Alexandria.—John F. Phillips, Master; Mrs. Clara A. Bullock, Lecturer; Miss Emogene B. Roby, Secretary.

268. Perling Beck, East Washington.—Edwin W. Muzzey, Master; M. E. Hixson, Lecturer; Cora E. Muzzey, Secretary.

269. Peaked Hill, Gilmanton.—William S. P. Sanderson, Master; Mary A. Wright, Lecturer; John R. Sawyer, Jr., Secretary.

270. Independence, Groton.—Daniel Kidder, Master; Emeline F. Kidder, Lecturer; Georgia A. Burley, Secretary.

AGRICULTURAL STATISTICS.

AGRICULTURAL STATISTICS.

Towns.	Pounds of butter made on farms.	Pounds of cheese made.	Gallons of milk produced.	Pounds of wool grown.	Number of silos.	Tons of ensilage.	Tons of fertilizer bought.	Cash from summer boarders.	Creameries.	Abandoned farms with buildings.
Albany	5,371	.....	5,916	40	.....	.....	3	$650	.....	6
Alexandria	24,500	.....	138,500	1,700	6	215	26½	1,200	.....	8
Allenstown	.....	.....	.....	.....	2	.....	.....	.....	.....	.....
Alstead	17,135	.....	110,200	2,765	27	941	31	765	.....	11
Alton	32,000	670	175,000	1,500	9	360	35	1,600	.....	15
Amherst	16,120	.....	375,760	.....	14	362	50	4,000	.....	4
Andover	32,470	915	177,930	680	18	588	15½	1,400	.....	.....
Antrim	1,500	.....	130,000	620	15	750	40	2,900	.....	7
Ashland	9,137	.....	99,200	450	6	450	11	1,200	.....	.....
Atkinson	2,000	.....	201,000	60	4	250	15	2,000	.....	3
Auburn	25,000	.....	90,600	350	5	70	30	2,000	.....	.....
Barnstead	34,820	1,550	337,907	838	20	613	56	1,710	.....	14
Barrington	50,000	.....	168,000	800	5	250	100	1,000	1	3
Bartlett	.....	.....	9,840	950	3	80	45	18,500	.....	4
Bedford	7,300	.....	823,568	20	40	2,400	100	200	1	.....
Bennington	4,250	100	42,657	100	6	240	4	150	.....	.....
Benton	1,000	.....	91,250	25	8	120	10	.....	.....	8

Bethlehem	6,700	.....	255,500	720	4	48	55	215,000	.....	1
Boscawen	3,217	350	56,795	948	8	275	17	260	.....	2
Bow	75,500	.....	228,125	150	9	250	30	.....	.....	4
Bradford	14,092	.....	227,610	1,073	13	368	41 2-5	5,319	.....	3
Brentwood	5,600	200	154,600	300	15	780	30	325	.....	3
Bridgewater	12,295	1,795	67,900	829	6	219	19½	3,350	.....	10
Bristol	11,955	740	188,705	187	4	315	21	1,000	1	.....
Brookline	5,000	.....	19,000	.....	2	85	10	300	.....	6
Brookfield	20,800	300	249,600	525	.....	9	.....	300	.....	2
Campton	61,910	5,200	155,400	2,292	9	305	56	11,900	1	2
Canaan	10,000	.....	306,720	3,700	4	120	8	1,700	.....	4
Canterbury	45,104	2,055	190,300	2,524	20	785	57¼	3,260	1	4
Candia	2,500	.....	152,205	200	1	20	15	800	.....	9
Centre Harbor	21,907	1,541	87,625	673	1	29	38	20,450	.....	2
Chatham	4,500	.....	4,872	1,040	3	60	15	1,000	.....	3
Charlestown	55,580	1,600	175,760	8,217	12	555	30	2,000	.....	4
Chester	1,000	200	263,000	206	15	300	5	.....	1	2
Chesterfield	20,000	.....	546,000	675	7	140	50	13,000	.....	10
Chichester	19,184	150	168,960	1,118	40	1,288	36	800	.....	5
Clarksville	6,820	40,000	.....	3,750	1	100	6	.....	.....	.....
Claremont	162,332	110	597,000	3,950	11	330	150	1,000	1	.....
Columbia	29,250	.....	117,000	3,065	10	600	50	2,000	.....	.....
Concord (ward 7)	1,200	.....	130,000	100	2	100	.....	.....	.....	.....
Cornish	1,500	.....	540,000	3,696	18	900	25	1,200	2	4
Croydon	15,000	.....	4,500	2,600	.....	.....	15	225	.....	2
Carroll	10,000	300	93,780	213	1	25	50	200,000	.....	.....
Dalton	16,000	800	219,369	3,100	3	250	13	.....	1	2
Danbury	2,200	865	1,171,000	669	20	7,907	57½	.....	1	8
Danville	15,756	.....	55,297	.....	1	25	20	1,250	.....	1
Deerfield	.....	150	182,500	1,356	3	200	80	450	1	.....
Deering	15,077	75	233,773	686	19	717	38½	1,293	.....	6
Derry	.....	.....	273,385	40	4	216	.....	6,000	1	.....
Dorchester	6,705	300	55,670	1,350	.....	.....	51½	.....	.....	4
Dublin	26,800	.....	99,400	417	9	.....	39 1-10	10,400	.....	.....
Dummer	16,250	.....	58,920	1,692	.....	.....	40	.....	.....	3
Dunbarton	25,331	765	220,568	363	28	820	55	1,200	.....	4
Eaton	11,000	100	.....	800	.....	.....	12	.....	.....	4
Easton	11,500	300	50,400	190	1	30	5	.....	.....	4
East Kingston	2,100	.....	31,510	100	.....	.....	35	400	.....	.....
Ellsworth	2,500	.....	12,000	500	.....	.....	4	.....	.....	29
Enfield	18,746	1,180	136,906	2,700	11	273	31 8-20	1,440	.....	6
Epping	12,245	300	78,178	591	1	50	26½	.....	.....	.....
Epsom	23,610	.....	227,800	1,985	15	421	36½	.....	.....	.....

STATISTICS — *Continued.*

Towns.	Pounds of butter made on farms.	Pounds of cheese made.	Gallons of milk produced.	Pounds of wool grown.	Number of silos.	Tons of ensilage.	Tons of fertilizer bought.	Cash from summer boarders.	Creameries.	Abandoned farms with buildings.
Exeter	1,000	.....	150,000	150	1	100	25	$500	.....	.....
Fitzwilliam	4,000	50	205,860	300	2	75	6	4,000	.....	4
Franconia	58,521	.....	182,880	290	5	225	30	.....	1	.....
Franklin	49,000	500	275,000	600	6	240	40	500	.....	.....
Francestown	1,200	.....	400,000	450	10	100	20	3,000	.....	9
Fremont	8,000	500	69,600	500	8	350	30	.....	1	.....
Gilford	56,000	1,800	300,000	3,500	23	1,000	50	4,000	.....	.....
Gilmanton	22,917	598	230,314	3,646	24	.....	.....	1,172	1	.....
Gilsum	12,550	.....	35,000	1,830	4	200	.....	.....	.....	4
Goffstown	17,755	75	750,000	130	48	1,652	340	10,023	.....	3
Gorham	9,000	.....	21,755	150	1	30	50	4,000	.....	1
Goshen	8,528	.....	108,587	485	6	150	10	50	1	10
Grafton	14,874	2,100	117,562	4,361	9	550	33	404	.....	1
Grantham	.....	.....	100,000	1,700	3	120	16	.....	1	8
Greenfield	90,000	.....	215,000	600	19	820	20	1,000	.....	.....
Greenland	1,000	.....	320,820	265	9	450	25	.....	.....	.....
Groton	20,000	.....	76,020	1,100	.....	.....	22	150	.....	8
Hampton	3,800	.....	85,000	220	4	.....	10	50,000	.....	.....
Hampstead	.....	.....	.....	.....	3	125	.....	.....	.....	.....
Hancock	15,000	100	296,000	1,100	11	500	20	.....	.....	6
Hanover	36,215	550	530,800	2,420	60	5,630	69	350	1	4
Harrisville	3,500	.....	91,250	1,270	2	300	25	150	.....	4
Haverhill	10,000	400	1,250,000	2,600	25	2,500	120	1,000	3	7
Hebron	10,537	2,050	89,912	1,278	2	106	9 7-20	5,950	1	6
Hill	17,770	7,140	39,940	1,295	5	130	13½	650	.....	.....
Hinsdale	2,250	.....	237,180	225	11	618	40	1,250	.....	.....
Hollis	15,600	.....	306,600	516	13	177	100	400	.....	3

Holderness	23,223	5,450	719,400	1,600	7	300	36	25,000	.....	.....
Hooksett	9,664	.....	139,571	77	4	110	9	.....	.....	.....
Hopkinton	51,171	1,200	257,299	1,284	26	10,075	40 1-3	8,226	1	9
Hudson	3,150	.....	325,640	30	5	2,140	55	900	1	2
Jackson	14,000	.....	106,000	2,000	.....	.....	20	70,000	.....	2
Jaffrey	80,000	.....	225,000	900	.....	.....	75	14,000	.....	5
Jefferson	10,000	.....	280,250	1,400	5	40	15	400,000	.....	.....
Kingston	2,000	500	1,500	250	.....	.....	40	1,500	.....	.....
Lancaster	.....	.....	.....	.....	8	.....	75	.....	1	.....
Landaff	17,575	700	.....	700	6	300	14	1,500	.....	3
Langdon	4,680	180	186,050	1,657	11	300	12	.....	.....	.....
Lebanon	33,982	125	475,230	3,209	25	2,770	40	232	2	.....
Lee	29,200	.....	186,880	800	3	200	30	300	.....	2
Lincoln	.....	.....	7,000	.....	.....	.....	.....	30,000	.....	.....
Lisbon	16,090	2,450	435,861	1,168	25	1,305	57	125,370	1	3
Litchfield	500	.....	103,300	50	.....	.....	12	390	.....	.....
Littleton	45,000	5,000	700,000	3,000	10	750	40	10,000	1	.....
Londonderry	13,000	.....	455,000	150	15	965	65	2,300	.....	3
Loudon	28,121	7,905	252,639	4,027	30	1,975	75	2,656	.....	5
Lyman	42,000	500	565,000	800	7	600	12	200	1	2
Lyme	27,800	1,200	708,520	5,500	26	1,404	75	500	1	2
Lyndeborough	4,900	.....	360,000	260	18	720	.....	.....	.....	3
Madbury	36,225	.....	110,412	520	.....	.....	15	.....	.....	8
Madison	13,200	.....	49,500	660	.....	.....	.....	6,000	.....	10
Marlborough	.....	.....	.....	.....	6	125	.....	.....	.....	2
Mason	.....	.....	*25,000	.....	3	125	20	.....	.....	2
Meredith	60,700	.....	121,000	2,330	18	900	40	8,800	1	7
Middleton	1,200	300	39,600	1,050	1	40	8	250	.....	6
Milford	9,000	.....	350,000	30	10	1,200	40	1,600	.....	.....
Milan	69,400	.....	176,600	1,572	1	15	117	.....	.....	3
Milton	35,000	500	168,630	1,458	5	150	50	1,500	.....	.....
Mont Vernon	6,000	.....	90,000	.....	6	250	16	6,000	.....	3
Monroe	.....	.....	.....	2,160	11	1,100	30	.....	.....	1
Nelson	70,550	.....	211,680	1,600	.....	.....	12	2,000	.....	9
Newbury	6,475	.....	54,900	860	2	100	150	.....	.....	23
New Boston	185,000	.....	*27,000	.....	40	.....	.....	5,000	1	.....
Newcastle	150	.....	17,520	.....	.....	.....	100	160,000	.....	.....
Newfields	.....	.....	130	228	.....	.....	10	.....	.....	.....
New Hampton	85,191	300	209,258	940	4	125	45½	175	1	9
New London	28,150	.....	141,800	1,373	15	620	36	13,050	.....	.....
Newington	2,500	.....	300,000	250	3	300	20	.....	.....	9
New Ipswich	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Newmarket	25,500	.....	202,800	.....	.....	.....	45	500	.....	.....

*Cans.

STATISTICS.— *Continued.*

Towns.	Pounds of butter made on farms.	Pounds of cheese made.	Gallons of milk produced.	Pounds of wool grown.	Number of silos.	Tons of ensilage.	Tons of fertilize bought.	Cash from summer boarders.	Creameries.	Abandoned farms with buildings.
Newton	10,000	.....	85,050	.....	1	60	16½	$450	.....	1
Northfield	68,965	2,000	173,962	600	5	250	70	.....	.....	.....
Northwood	30,000	.....	180,000	550	9	675	40	300	1	3
Nottingham	32,368	342	45,012	1,544	1	50	22 2-5	436	.....	10
Orange	5,230	.....	46,712	405	1	15	4	100	.....	6
Orford	.....	.....	5,000	1,900	14	750	.....	.....	1	8
Pelham	11,070	.....	519,980	100	.....	.....	22	680	1	3
Pembroke	6,000	.....	330,000	600	17	605	35	1,000	1	.....
Peterborough	.....	.....	48,000	.....	20	1,000	.....	.....	1	5
Plaistow	1,750	.....	63,750	.....	.....	.....	.....	.....	.....	.....
Plainfield	28,080	2,100	364,500	10,000	4	.....	22	1,000	.....	4
Plymouth	7,815	880	153,654	715	23	1,233	240	.....	1	8
Pittsburg	38,400	500	373,760	4,700	.....	.....	10	1,000	.....	3
Portsmouth (ward 4)	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Randolph	6,225	.....	20,488	726	.....	.....	5	8,000	.....	3
Rochester (ward 5)	7,360	100	21,425	240	.....	.....	5	100	1	.....
Roxbury	3,890	.....	14,662	495	2	55	.....	.....	.....	1
Rumney	88,438	.....	255,965	918	12	400	350	500	1	3
Rye	9,000	.....	221,300	176	20	500	8	49,000	.....	.....
Salem	4,500	100	450,000	400	3	300	350	.....	.....	.....
Salisbury	26,408	3,375	111,379	5,094	8	122	29	767	.....	3
Sanbornton	74,050	680	204,421	3,847	10	325	45½	1,000	.....	5
Sandwich	5,056	.....	11,770	2,232	2	40	23¾	6,390	1	6
Seabrook	2,100	.....	25,275	100	1	80	6	150	.....	.....
Sharon	4,471	.....	15,581	151	.....	.....	4	.....	.....	10
Shelburne	15,300	.....	55,845	605	.....	.....	10	12,000	.....	1
South Hampton	5,520	.....	87,900	.....	.....	.....	54½	275	.....	.....
Springfield	27,743	.....	29,580	2,396	1	75	9	3,650	.....	7

Stark	34,400	.....	88,500	1,020	.....	.....	18	.....	.....	.....
Stewartstown	80,000	500	1,240	5,200	1	.....	30	5,000	1	1
Stoddard	12,450	.....	112,050	1,395	2	150	20	500	.....	6
Stratham	500	.....	217,000	.....	15	.....	200	.....	.....	.....
Strafford	.....	.....	.....	1,790	20	.....	50	.....	.....	11
Sullivan	14,252	.....	97,087	951	9	182	8	.....	.....	5
Sunapee	35,000	.....	85,000	536	.....	.....	30	20,000	.....	.....
Surry	20,665	.....	37,150	700	10	410	16	500	.....	.....
Sutton	14,323	1,570	105,931	2,968	5	180	20	.....	1	9
Swanzey	71,905	.....	215,715	1,200	12	480	90	2,500	1	9
Tamworth	5,000	.....	10,000	800	.....	.....	20	10,000	.....	4
Temple	24,990	.....	104,996	532	7	559	29	2,920	.....	8
Thornton	48,000	.....	150,000	1,000	10	300	25	.....	.....	3
Troy	7,054	.....	32,054	6	3	30	3½	.....	.....	5
Tuftonborough	3,325	200	207,736	690	2	30	30	6,000	.....	.....
Unity	35,623	.....	75,125	4,470	5	150	55	.....	.....	9
Wakefield	20,100	500	598,160	816	4	200	40	4,000	1	7
Walpole	420,000	.....	900,500	8,000	35	2,450	.....	.....	.....	.....
Warner	43,600	.....	129,500	1,351	4	141	.....	1,000	.....	2
Warren	24,000	180	16,000	1,100	23	400	60	3,800	1	3
Waterville	.....	.....	.....	.....	.....	.....	1	15,000	.....	.....
Weare	9,650	300	610,966	2,145	39	2,340	57	600	.....	.....
Wentworth	9,365	72	230,200	966	8	504	31½	1,360	1	5
Westmoreland	50,000	.....	370,000	4,000	15	700	50	.....	1	7
Whitefield	20,000	2,000	186,000	500	.....	4	200	20,000	1	1
Wilmot	10,240	380	104,010	2,789	5	200	16	237	.....	4
Wilton	10,900	.....	444,560	500	11	650	40	2,000	1	3
Winchester	55,000	500	498,660	500	20	830	70	.....	1	.....
Windham	3,000	33	187,600	9	325	70	.....	2,700	.....	3
Wolfeborough	50,000	.....	350,000	.....	.....	.....	.....	.....	1	6
Woodstock	700	.....	190,000	25	.....	10	.....	25,000	.....	1

INDEX.

THOMPSON HALL.

REPORT

(BIENNIAL)

OF THE

BOARD OF TRUSTEES

OF THE

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS

TO THE

NEW HAMPSHIRE LEGISLATURE

NOVEMBER 1, 1898

MANCHESTER, N. H.
ARTHUR E. CLARKE, PUBLIC PRINTER
1898.

BOARD OF TRUSTEES.

Hon. GEORGE A. WASON, New Boston, *President.*
His Excellency GEORGE A. RAMSDELL, Nashua, *ex officio.*
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ABRAHAM F. EMERSON, Manchester, *Acting Treasurer.*

REPORT OF THE BOARD OF TRUSTEES.

To the Honorable Senate and House of Representatives:

The Board of Trustees of the New Hampshire College of Agriculture and the Mechanic Arts respectfully submits the following report for the two years ending June 30, 1898:

The plant.

No new buildings have been erected during the two years. In December, 1896, the former residence of Benjamin Thompson and the building adjoining it, both the property of the college, were burned. The fire started in an

Benjamin Thompson house.

adjacent building not belonging to the college, and although everything possible was done by the students and the people of the town the buildings were entirely consumed. The amount of the insurance, two thousand dollars ($2,000) was promptly paid, but did not cover the loss. There is no protection against fire in the town, but if the college water supply had been carried to the village, as has been recommended, the college buildings might easily have been saved. The expense of laying the pipes and connecting hydrants would have been less than the loss by this fire alone.

Creamery.

By judicious cutting in the forest belonging to the college, timber was prepared for a new creamery. The creamery is doing a business amounting to something more than a thousand dollars a month, and is practically self-supporting, costing the state absolutely nothing. But the erection of the new creamery is delayed for lack of available funds.

Agricultural building.

Provision should be made, at the earliest possible moment, for a suitable building for the Agricultural and Horticultural departments. The act passed by the legislature of 1894, establishing a course in Horticulture and a Two Years' Course in Agriculture, has so increased the

number of classes that all the departments are embarrassed by lack of room. A building somewhat similar to those now in use in Ohio, Michigan, Wisconsin, and other states would relieve the pressure and greatly facilitate the work of all the departments. While this is a present and imperative need, it must be stated that the expense of maintaining such a building would not be easily met by the current income of the college.

College farm.

The development of the farm has been, as was to be expected, one of the greatest drains upon the resources of the college. The funds which could by any possibility be used for such a purpose are limited by strict provisions. The appropriations by the national government, by which the college is mainly supported, cannot be so used, but must be applied to defray the expenditure for teaching, books, and apparatus, and for nothing else. The national appropriation for the Experiment Station is no less rigidly reserved for special uses, specifically excluding the farm. Moreover, the funds available for general purposes must provide for the many minor expenses, such as repairs, janitor work, heating, lighting, and the supply of power for the mechanical department. These items make the cost of maintaining a plant of this size an increasing burden.

Dining hall.

The item of expense to the students is vital. At present the chief outlay demanded of them is for board and rooms. The college has no dormitory, and, perhaps, does not absolutely need one for the present. But at a small cost a dining-hall could be supplied, where the expense for board could be reduced nearly one half. By actual experience, students have found that by the "club" system they can secure good board at a cost barely exceeding two dollars a week. A building costing not more than five thousand dollars would provide for them abundant accommodations for many years.

Boiler and reservoir.

The attention of your honorable bodies is again called to the necessity of putting in a new boiler, and an auxiliary water supply. The boiler would cost $1,225, and the new reservoir, $1,150, a total of $2,375.

Economy demands that these matters be provided for at once.

Valentine Smith Scholarships.

By the generosity of Mr. Hamilton Smith, the sum of ten thousand dollars ($10,000) has been offered to the state, upon the condition that interest upon that sum, at four per cent, be guaranteed to the college, for the purpose of establishing four scholarships, to be called "The Valentine Smith Scholarships." This should receive favorable action.

Faculty.

In the teaching force only minor changes have been made. The demands upon it are constantly increasing, and it will be the endeavor of the board of trustees to see that these demands are fully supplied, so far as the funds available will permit.

Courses of study.

Recognising the conditions which confront the college, we have made important changes in the courses of study. By far the most significant change is the elevation of the standard. The college is now, for the first time, fully prepared to receive the graduates of our high schools and academies, and to offer them four year courses of full collegiate grade. The two year courses appeal to those who have not had the advantage of training in a high school or an academy. We have also introduced a preparatory course of one year, designed to supply the lack of complete preparation on the part of students who would not otherwise be able to enter upon full college work. That the changes indicated have been justified by the conditions prevailing in the state is demonstrated by the size and the quality of the class entering with the beginning of the current college year.

Attention should be called to the funds bequeathed by Benjamin Thompson, in trust, to the state. Under the present policy of the state treasurer the amount of those funds actually on hand is constantly decreasing, while the fixed charges upon it have the appearance of constantly increasing. The practical effect of turning the securities into cash, and using the proceeds to defray the current expenses of the state, will

Bequest of Benjamin Thompson.

be, that when the term of twenty years has expired the state will be left with a fixed charge of approximately thirty-two thousand dollars with no apparent source of income to correspond therewith. In other words, the sum of three hundred and fifty thousand dollars will have been expended by the state, and the interest upon seven hundred and ninety-seven thousand dollars will be drawn, annually, from the current revenues of the state. We respectfully urge that the officials of the state should not, for the sake of securing financial statements which are unduly favorable for the present, maintain a policy which will so unnecessarily burden the people in later years. It may be true, in general, that the state should not carry upon its books a list of assets in the form of common securities. But if this is true, an exception should be made in a case like this. If the whole amount of the Thompson bequest were invested, including that already realized upon, it would yield an income greater than the fixed charge imposed upon it by the conditions of the bequest. We respectfully urge that this matter receive your earnest attention.

Included in this report will be found the reports of the treasurer and the president, for the two years; also the catalogue of the college and the two annual reports of the Experiment Station. The practice of issuing only biennial reports is ill-advised in the case of an institution which because of its nature and its relations with the general government, must prepare its reports annually. Whatever may be the case with the other state institutions, in the case of the college the law should be so amended that the reports should be printed annually, and we recommend that this change be made.

Respectfully submitted.

GEORGE A. WASON,
President of the Board of Trustees.

TREASURER'S GOVERNMENT REPORT.

Name of Institution, THE NEW HAMPSHIRE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS.

Post-office, DURHAM; *State,* NEW HAMPSHIRE.

Report of treasurer of said institution, to the Secretary of Agriculture and the Secretary of the Interior, of amount received under act of congress of August 30, 1890, in aid of colleges of agriculture and the mechanic arts, and of the disbursements thereof, to and including June 30, 1897.

	Receipts.	Disbursements.
Balance on hand July 1, 1896 . .	$274.06	
Received from the United States government	22,000.00	
	$22,274.06	
Disbursed for instruction and facilities:		
In agriculture, as per schedule A . . .		$1,391.97
In mechanic arts, as per schedule B . . .		5,649.79
In English language, as per schedule C . .		3,836.98
In mathematical science, as per schedule D .		2,017.61
In natural and physical sciences, as per schedule E		6,848.44
In economic science, as per schedule F . .		2,267.49
Total expended during year . . .		$22,012.28
Balance remaining unexpended July 1, 1897 .		$261.78

I hereby certify that the above account is correct and true, and, together with the schedules hereunto attached, truly represents the details of expenditures for the period and by the institution named, and that said expenditures were only

to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic science, with special reference to their application in the industries of life, and to the facilities for such instruction, according to my best knowledge and belief.

(Signed)
A. F. Emerson,
Acting Treasurer.

Schedule A.—*Disbursements for instruction in Agriculture, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For the salaries of (1) Professor of Agriculture, $541.61; (2) Professor of Agricultural Chemistry, $541.61; (3) Instructors in Agriculture, $58.75	$1,141.97
II. For facilities, as follows:	
For apparatus	250.00
Total	$1,391.97

Schedule B.—*Disbursements for instruction in Mechanic Arts, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For the salaries of (1) Professor of Mechanical Engineering, $2,166.61; (2) Instructor in Machine Work, $1,083.32; (3) Instructor in Wood Work, $961,37; (4) Instructors in Drawing, $708.32	$4,919.62
II. For facilities, as follows:	
Apparatus, machinery, stock, and material .	545.77
For text-books and reference books . . .	184.40
Total	$5,649.79

SCHEDULE C.— *Disbursements for instruction in English and Modern Languages, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For the salaries of (1) Instructors in English Language	$3,499.82
II. For facilities, as follows:	
For text-books and reference books	337.16
Total	$3,836.98

SCHEDULE D.—*Disbursements for instruction in Mathematical Science, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For the salary of the Professor of Mathematics	$1,841.61
For the salary of Instructor in Mathematics	176.00
Total	$2,017.61

SCHEDULE E.—*Disbursements for instruction in Physical Science, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For the salaries of (1) Instructor in Physics, $1,074.96; (2) Professor of Chemistry, $2,166.61; (3) Instructor in Chemistry, $540.00	$3,781.57
II. For facilities, as follows:	
For apparatus	681.41
For text-books and reference books	77.61
For stock and material	35.85
Total	$4,576.44

SCHEDULE E (2).—*Disbursements for instruction in Natural Science, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For salary of Professor of Entomology and Zoölogy	$1,729.00
For salaries of Instructors in Botany . . .	448.16
II. For facilities, as follows:	
For apparatus	5.91
For text-books and reference books . . .	88.93
Total	$2,272.00

SCHEDULE F.—*Disbursements for instruction in Economic Science, and for facilities for such instruction, during the year ended June 30, 1897.*

I. For instruction, viz.:	
For Professor of Economic Science and History .	$2,166.61
For text-books and reference books . . .	100.88
Total	$2,267.49

TREASURER'S GOVERNMENT REPORT.

Name of Institution, THE NEW HAMPSHIRE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS.

Post-office, DURHAM; *State,* NEW HAMPSHIRE.

Report of treasurer of said institution, to the Secretary of Agriculture and the Secretary of the Interior, of amount received under act of congress of August 30, 1890, in aid of colleges of agriculture and the mechanic arts, and of the disbursements thereof, to and including June 30, 1898.

Balance on hand July 1, 1897 . .	$261.78	
Received from the United States government	23,000.00	
		$23,261.78

Disbursed for instruction and facilities:

In agriculture, as per schedule A . . .	$2,151.72
In mechanic arts, as per schedule B . . .	6,455.93
In English language, as per schedule C . .	2,367.89
In mathematical science, as per schedule D .	2,207.84
In natural and physical sciences, as per schedule E	7,313.29
In economic science, as per schedule F . .	2,066.97
Balance remaining unexpended July 1, 1898 .	698.14
	$23,261.78

I hereby certify that the above account is correct and true, and, together with the schedules hereunto attached, truly represents the details of expenditures for the period and by the institution named, and that said expenditures were only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical,

natural, and economic science, with special reference to their application in the industries of life, and to the facilities for such instruction, according to my best knowledge and belief.

(Signed)

A. F. Emerson,
Acting Treasurer.

Schedule A.—*Disbursements for instruction in Agriculture, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For the salaries of (1) Professor of Agriculture, $499.96; (2) Professor of Agricultural Chemistry, $499.96; (3) Instructors in Agriculture, $776.26	$1,776.18
II. For facilities, as follows:	
For apparatus	173.55
For text-books and reference books . . .	201.99
Total	$2,151.72

Schedule B.—*Disbursements for instruction in Mechanic Arts, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For the salaries of (1) Professor of Mechanical Engineering, $1,999.96; (2) Instructor in Machine Work, $1,000.00; (3) Instructor in Wood Work, $1,005.75; (4) Instructors in Drawing, $1,075.00	$5,080.71
II. For facilities, as follows:	
Apparatus	734.68
For text-books and reference books . . .	122.21
For stock and material	518.33
Total	$6,455.93

SCHEDULE C.—*Disbursements for instruction in English and Modern Languages, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For the salaries of (1) Instructors in English Language	$2,222.43
II. For facilities, as follows:	
For text-books and reference books	145.46
Total	$2,367.89

SCHEDULE D.—*Disbursements for instruction in Mathematical Science, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For the salary of the Professor of Mathematics	$1,699.96
For the salary of Instructors in Mathematics	460.00
II. For facilities, as follows:	
For apparatus	5.20
For text-books and reference books	42.68
Total	$2,207.84

SCHEDULE E.—*Disbursements for instruction in Physical Science, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For the salaries of (1) Instructors in Physics, $1,248.99; (2) Professor of Chemistry, $2,059.96; (3) Instructors in Chemistry, $646.65	$3,955.60
II. For facilities, as follows:	
For apparatus	716.28
For text-books and reference books	144.56
For stock and material	193.28
Total	$5,009.72

SCHEDULE E (2).—*Disbursements for instruction in Natural Science, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For salary of Professor of Entomology and Zoölogy	$1,560.00
For salaries of Instructors in Botany . .	452.34
II. For facilities, as follows:	
For apparatus	109.33
For text-books and reference books . . .	179.44
For stock and material	2.46
Total	$2,303.57

SCHEDULE F.—*Disbursements for instruction in Economic Science, and for facilities for such instruction, during the year ended June 30, 1898.*

I. For instruction, viz.:	
For Professor of Economic Science and History	$1,999.96
For text-books and reference books . . .	67.01
Total	$2,066.97

TREASURER'S REPORT.

To the President and Trustees of the New Hampshire College of Agriculture and the Mechanic Arts:—Your Treasurer respectfully submits his thirty-first annual report, for the year ended July 1, 1897.

He charges himself as follows:

Balance in treasury July 1, 1896	$5,581.38	
Conant fund	500.00	
Income from Conant fund	2,580.50	
Annual state appropriation	3,000.00	
Special state appropriation	3,105.00	
State appropriation, Law of 1895	2,500.00	
Interest on New Hampshire bonds	4,800.00	
Annual government appropriation	15,000.00	
Special government appropriation	22,000.00	
Rents	452.29	
Charles S. Murkland, president	3,310.63	
Erskine Mason memorial fund	4.00	
State treasurer, account Experiment Station	1,110.00	
		$63,943.80

He credits himself as follows:

1896.		
July 27.	Order C. S. Murkland, Pres't.,	$3,120.12
27.	" " "	2,620.25
Aug. 10.	Taxes, H. S. Goodwin loan,	99.02
20.	Order C. S. Murkland, Pres't.,	5,543.78
Sept. 17.	" " "	7,486.29
Oct. 23.	" " "	5,990.13
Nov. 25.	" " "	5,075.90
Dec. 11.	" " "	3,954.56

1897.					
Jan.	9.	Order	C. S. Murkland,	Pres't.,	$6,170.50
Feb.	9.	"	"	"	4,292.64
Mar.	11.	"	"	"	5,676.71
Apr.	23.	"	"	"	6,526.97
May	1.	"	"	"	528.01
	10.	"	"	"	2,946.45
June	11.	"	"	"	3,099.76
					$63,131.09
Cash on deposit in First National bank,					812.71
					$63,943.80

(Signed)

A. F. Emerson,
Acting Treasurer.

TREASURER'S REPORT.

To the President and Trustees of the New Hampshire College of Agriculture and the Mechanic Arts:—Your Treasurer respectfully submits his thirty-second annual report, for the year ended July 1, 1898.

He charges himself as follows:

Balance in treasury July 1, 1897	$812.71	
Income from Conant fund	2,478.00	
Annual state appropriation	3,000.00	
Special state appropriation	2,500.00	
Interest on New Hampshire bonds	4,800.00	
Annual government appropriation	15,000.00	
Special government appropriation	23,000.00	
Rents	347.67	
Charles S. Murkland, president	5,230.66	
Erskine Mason memorial fund	3.77	
Insurance	2,000.00	
Note account due First National bank	5,497.50	
State treasurer, account Experiment Station	627.00	
Taxes refunded, H. S Goodwin loan	70.13	
		$65,367.44

He credits himself as follows:

1897.

July	1.	1896 tax, H. S. Goodwin loan,	$39.12
	1.	Note Cyprian Souci	2,000.00
Aug.	3.	Order C. S. Murkland, Pres't.,	5,539.42
	10.	" " "	2,969.27
Oct.	12.	" " "	9,128.75
Nov.	12.	" " "	4,588.36
Dec.	8.	" " "	7,884.48

1898.			
Jan.	21.	Order C. S. Murkland, Pres't.,	$2,968.73
Feb.	18.	" " "	5,694.61
Mar.	4.	" " "	3,546.50
	4.	" " "	1,364.69
April	4.	" " "	5,271.66
	4.	" " "	2,761.01
	9.	" " "	827.91
	16.	" " "	1,548.46
	29.	1897 tax, H. S. Goodwin loan,	38.75
May	4.	Order C. S. Murkland, Pres't.,	81.28
	4.	" " "	2,681.35
	7.	" " "	971.43
June	3.	" " "	189.20
	3.	" " "	2,792.05
	3.	Treasurer's fees and expense, Goodwin tax,	.75
	28.	Order C. S. Murkland, Pres't.,	792.78
			$63,680.56
Balance in First National bank,			1,686.88
			$65,367.44

(Signed)

A. F. Emerson,
Acting Treasurer.

REPORT OF THE PRESIDENT.

Summary of Transactions from June 30, 1896, to June 30, 1897.

GROSS RECEIPTS.

Received from A. F. Emerson (acting treasurer) $63,943.80

GROSS PAYMENTS.

Instruction	$20,194.52	
Experiment Station	18,272.68	
Stock and material	2,307.92	
Miscellaneous payments	22,355.97	
Balance unexpended	812.71	
		$63,943.80

CHARLES S. MURKLAND,
President.

We have examined reports, and find them correctly cast and properly vouched for.

(Signed)
GEORGE A. RAMSDELL.
JOHN G. TALLANT.

FINANCIAL STATEMENT.

Total Receipts and Expenditures, all sources, for the fiscal year ending June 30, 1897.

INCOME.

	U. S. government funds.	State appropriation (special).	General.	Total.
Balance July 1, 1896	$274.06		$5,307.32	$5,581.38
Government appropriation, law 1890	22,000.00			
Annual government appropriation, Hatch fund	15,000.00			37,000.00
State appropriation, law of 1895		$2,500.00		
State appropriation, special		3,105.00		
State appropriation, annual			3,000.00	8,605.00
Conant fund			3,080.50	3,080.50
Interest on New Hampshire bonds			4,800.00	4,800.00
Receipts, real estate, rents			452.29	452.29
Receipts, sales of farm produce			2,029.68	2,029.68
Receipts, fertilizer analyses			1,243.00	1,243.00
Income, Erskine Mason memorial fund			4 00	4.00
Library fees and sundries			1,147.95	1,147.95
	$37,274.06	$5,605.00	$21,064.74	$63,943.80

EXPENDITURES.

	U. S. government funds.	State appropriation (special).	General.	Total.
Salaries	$7,378.70	$764.57	$739.86	
Labor	2,392.36	294.07	1,172.14	
Publications	787.60			
Postage and stationery	84.61			
Freight and express	172.78	20.46	11.20	
Heat, light, and water	519.59			
Chemical supplies	67.66		69.02	
Seeds, plants, and sundries	201.72	148.08	157.99	
Carried forward	$11,605.02	$1,227.18	$2,150.21	

EXPENDITURES.—*Continued.*

	U. S. government funds.	State appropriation (special).	General.	Total.
Brought forward	11, 605.02	$1,227.18	$2,150.21	
Fertilizers	245.60			
Feeding stuffs	665.59		145.46	
Library	136.24			
Tools, implements, and machinery	780.83	68.70	78.42	
Furniture and fixtures	57.56			
Scientific apparatus	168.84		46.14	
Live stock	496.77		698.67	
Traveling expenses	125.45	21 32		
Contingent expenses	1.30	7.85		
Buildings and repairs	716.80	1,174.95	153.78	
Payments from annual government appropriation, Hatch fund				$15,000.00
Payments from state appropriation, law 1895				2,500.00
Payments from farm and fertilizer analyses receipts				3,272.68
Purchase of J. W. E. Thompson estate		3,105.00		3,105.00
Instruction:				
Agriculture	1,141.97			
Mechanic arts	4,919.62			
English language	3,499.82			
Mathematics	2,017.61			
Natural science	5,958.73			
Economic science and history	2,166.61			
For facilities as follows:				
Agriculture:				
Live stock	250.00			
Mechanic Arts:				
Apparatus	184.09			
Stock	320.29			
Books	184.40			
Freight and express	41.39			
English:				
Books	337 16			
Chemistry:				
Apparatus	367.09			
Stock	35.85			
Books	65.87			
Natural Science:				
Apparatus	5.91			
Books	88.93			
Physics:				
Apparatus	314.32			
Books	11.74			
Economic Science and History:				
Books	100.88			
Payments from Morrill fund government appropriation, law of 1890				22,012.28
Instruction:				
Modern languages			490.16	
Carried forward	$37,012.28	$5,605.00	$3,762.84	$45,889.96

EXPENDITURES.— *Continued.*

	U. S. government funds.	State appropriation (special).	General.	Total.
Brought forward	$37,012.28	$5,605.00	$3,762.84	$45,889.96
GENERAL ACCOUNTS.				
President and secretary, salaries			832.29	
Power and service department:				
Labor			2,133.28	
Apparatus			95.77	
Coal			1,804.74	
Stock			281.88	
Repairs			27.98	
Freight and express			14.08	
Expenses (sundry)			1.12	
Curator's department:				
Janitor work			631.64	
Stock			284.37	
Expenses			9.90	
Library:				
Books and periodicals			107.96	
Furniture and fixtures			24.15	
Chapel:				
Expenses			3.57	
Insurance			838.32	
Buildings and repairs			4,085.54	
Trustees' expenses			508.44	
Commencement exercises:				
Expenses			104.68	
Smyth prizes			70.00	
Clerical work			105.91	
Postage, printing, and stationery			727.31	
Furniture and fixtures			50.74	
Freight and express			59.44	
Athletics:				
Appropriation			200.00	
Gymnastic apparatus			4.75	
Permanent improvements			699.76	
Ladies' dormitory:				
Matron's expenses			432.81	
Repairs			292.82	
Heat and light			168.93	
Freight and express			14.60	
Furniture			233.29	
Janitor work			28.40	
Payment of tax, Goodwin loan			99.02	
Conant scholarships $3,080.50				
Conant schol'rships tuition 1,800.00				
Conant schol'rships payments			1,280.50	
Contingent expenses			305.28	
Traveling expenses			187.70	
Payments from general income				17,241.13
Excess of receipts over expenditures	261.78		550.93	812.71
	$37,274.06	$5,605.00	$21,064.74	$63,943.80

Cash in treasury July 1, 1897, $812.71.

CLEMENT S. MORRIS,
Purchasing Agent.

REPORT OF THE PRESIDENT.

Summary of Financial Transactions from June 30, 1897, to June 30, 1898.

GROSS RECEIPTS.

Received from A. F. Emerson (acting treasurer) $65,367.44

GROSS PAYMENTS.

Instruction	$20,194.52	
Experiment Station	15,286.45	
Stock and material	2,387.92	
Miscellaneous payments	25,811.67	
Balance unexpended	1,686.88	
		$65,367.44

CHARLES S. MURKLAND,
President.

We have examined reports, and find them correctly cast and properly vouched for.

(Signed)
JOHN G. TALLANT.
ROSECRANS W. PILLSBURY.

FINANCIAL STATEMENT.

Total Receipts and Expenditures, all sources, for the fiscal year ending June 30, 1898.

INCOME.

	Hatch fund, and fees, Experiment Station.	U. S. Government, Morrill fund.	General.	Total.
Balance July 1, 1897	.....	$261.78	$550.93	$812.71
Income from Conant fund	.....	.....	2,478.00	.....
Annual state appropriation	.....	.....	3,000.00	.....
State appropriation, law of 1897	.....	.....	2,500.00	.....
Interest on New Hampshire bonds	.....	.....	4,800.00	12,778.00
Annual government appropriation	$15,000.00	.....	.....	15,000.00
Government appropriation, law of 1890	.....	23,000.00	.....	23,000.00
L. Thompson, treas. real estate committee	.....	.....	347.67	.....
C. S. Murkland, president	.....	.....	5,230.66	.....
Income, Erskine Mason memorial fund	.....	.....	3.77	.....
Insurance	.....	.....	2,000.00	.....
Due First National Bank (Note account)	.....	.....	5,497.50	13,079.60
State treasurer's account, Experiment Station	627.00	.....	.....	627.00
Account taxes refunded, H. S. Goodwin's loan	.....	.....	70.13	70.13
	$15,627.00	$23,261.78	$26,478.66	$65,367.44

EXPENDITURES.

	Hatch fund. and fees, Experiment Station.	U. S. Government, Morrill fund.	General.	Total.
Salaries	$8,148.88			
Labor	1,336.22			
Publications	976.20			
Postage and stationery	136.44			
Freight and express	79.19			
Heat, Light, and Water	981.33			
Chemical supplies	172.92			
Seeds, plants, and sundry supplies	40.27			
Fertilizers	217.80			
Feeding stuffs	400.17			
Library	401.45			
Tools, implements, machinery	310.64			
Furniture and fixtures	66.43			
Scientific apparatus	621.18			
Live stock	32.60			
Traveling expenses	261.38			
Contingent expenses	75.77			
Building and repairs	741.13			
Total expenditures from Hatch fund				$15,000.00
Expenditures on Experiment Station from state treasurer's account:				
Salaries	$286.45			286.45
Instruction:				
Agriculture		$1,776.18		
Mechanic arts		5,080.71		
English language		2,222.43		
Mathematics		2,159.96		
Natural science		5,967.94		
Economic science and history		1,999.96		
For facilities as follows:				
AGRICULTURE.				
Text-books and reference books		201.99		
Apparatus		162.84		
Stock		1.91		
Material		8.80		
MECHANIC ARTS.				
Text books and reference books		122.21		
Apparatus		734.68		
Stock		518.33		
ENGLISH LANGUAGE.				
Text-books and reference books		145.46		
Carried forward	$15,286.45	$21,103.40		$15,286.45

EXPENDITURES.— *Continued.*

	Hatch fund and fees, Experiment Station.	U. S. Government, Morrill fund.	General.	Total.
MATHEMATICAL SCIENCE.				
Brought forward	$15,286.45	$21,103.40		$15,286.45
Text-books and reference books		42.68		
Apparatus		5.20		
NATURAL SCIENCE.				
Text-books and reference books		324.00		
Apparatus		825.61		
Stock		195.74		
ECONOMIC SCIENCE AND HISTORY.				
Text-books and reference books		67.01		
Payment from Morrill fund, government appropriation, law 1890				22,563.64
Instruction:				
Modern languages			$448.54	
Philosophy:				
Apparatus			4.52	
				453.06
GENERAL ACCOUNTS.				
President's and secretary's salaries			$2,316.83	
POWER AND SERVICE.				
Labor			2,279.77	
Coal			1,094.88	
Apparatus			362.55	
Stock			366.55	
Repairs			60.84	
CURATOR'S DEPARTMENT.				
Janitor work			957.87	
Stock			178.66	
Expenses			7.88	
LIBRARY.				
Books and periodicals			387.68	
CHAPEL.				
Expenses			66.00	
WOMEN'S DORMITORY.				
Matron's salary			$160.00	
Matron's expenses			234.72	
Repairs			22.56	
Heat and light			93.37	
Janitor work			135.54	
Carried forward	$15,286.45	$22,563.64	$9,178.76	$38,303.15

EXPENDITURES.— *Continued.*

	Hatch fund and fees, Experiment Station.	U. S. Government, Morrill fund.	General.	Total.
MISCELLANEOUS.				
Brought forward	$15,286.45	$22,563.64	$9,178.76	$38,303.15
Fire insurance preminms			978.57	
Building and repairs			656.69	
Real estate rents			57.11	
Trustees' expenses			698.38	
Commencement exercises			224.26	
Erskine Mason memorial payments			8.00	
Smyth prize payments			200.00	
C. H. Bailey prize payments			20.00	
Clerical work			100.97	
Postage, printing, and stationery			798.66	
Permanent improvements			193.36	
Furniture and fixtures			340.55	
Freight and express			461.65	
Athletics (appropriation)			100.00	
Gymnastic apparatus			237.90	
Contingent expenses			177.55	
Traveling expenses			237.97	
Conant scholarships $1,900 Tuition and fees 1,251				
Conant payments $649			649.00	
				14,866.32
FARM DEPARTMENT.				
Labor			$2,104.79	
Fertilizers			20.10	
Heat, light, and water			7.24	
Feed			568.03	
Buildings and repairs			724.35	
Live stock			1,238.18	
Seeds and sundry supplies			154.71	
Tools			324.88	
Freight and express			167.75	
				5,310.03
CREAMERY.				
Salaries			$980.25	
Milk purchases			1,548.48	
Apparatus			150.86	
Freight and express			21.61	
Stock			14.55	
Building and repairs			205 88	
Expense			42.56	
Supplies (sundry)			52.98	
Labor			26.84	
				3,044.01
HORTICULTURAL DEPARTMENT.				
Labor			$45.38	
Seeds			12.33	
Tools			4 86	
Freight and express			14.06	
Building and repairs			1.80	
				78.43
Carried forward	$15,286.45	$22,563.64	$23,751.85	$61,601.94

EXPENDITURES.—*Continued.*

	Hatch fund and fees, Experiment Station.	U. S. Government, Morrill Fund.	General	Total.
SUNDRIES.				
Brought forward	$15,286.45	$22,563.64	$23,751.85	$61,601.94
Note: Cyprian Souci	.....	.....	2,000.00	.....
Treasurer's fees and expenses, Goodwin loan tax	.....	.....	.75	.....
1896, Goodwin loan tax	.....	.....	39.12	.....
1897, Goodwin loan tax	.....	.....	38.75	2,078.62
Excess of receipts over expenditures	340.55	698.14	648 19	1,686.88
	$15,627.00	$23,261.78	$26,478.66	$65,367.44

Cash in treasury July 1, 1898, $1,686.88.

CLEMENT S. MORRIS,

Purchasing Agent.

PRESIDENT'S GOVERNMENT REPORT.

THE NEW HAMPSHIRE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS.

DURHAM, N. H., November, 1897.

Report of the president to the Secretary of Agriculture and the Secretary of the Interior, as required by act of congress of April 30, 1890, in aid of colleges of agriculture and the mechanic arts.

I. CONDITION AND PROGRESS OF THE INSTITUTION FOR THE YEAR ENDED JUNE 30, 1897, ESPECIALLY—

1. Changes in course or methods of instruction.

2. Purpose, structural character, and cost of new buildings or additions to buildings.

1. The only significant change in the course of instruction has been the gradual development of the preparatory department, resulting from the attempt to place the institution upon a strictly collegiate plane.

The possible constituency of the college represents the city high school on the one hand, and the district school of the rural village on the other hand.

The grade of the college has been too low for the one, and too high for the other. By raising the standard and offering a preparatory year, it is hoped that this difficulty will be overcome.

During the year ending June 30, 1897, preparatory studies were introduced with the "Two Years' Course in Agriculture." Beginning with July 1, 1897, the preparatory year was definitely offered.

II. The only important addition to the buildings of the college has been a large greenhouse for the use of the Horti-

cultural department, the cost of which is approximately $1,500.

II. RECEIPTS FOR AND DURING THE YEAR ENDED JUNE 30, 1897.

1. Balance on hand July 1, 1896, over and above all indebtedness (excluding funded debt, if any)	$5,581.38
2. State aid:	
(*a*) Income from endowment granted by state	.....
(*b*) Appropriation for current expenses	3,000.00
(*c*) Appropriation for special expenses	2,500.00
(*d*) Appropriations for building or for other special purposes	3,105.00
3. Federal aid:	
(*a*) Income from land grant, act of July 2, 1862	4,800.00
(*b*) For experiment stations, act of March 2, 1887	15,000.00
(*c*) Additional endowment, act of August 30, 1890	22,000.00
4. Fees and all other sources	7,957.42
Total	$63,943.80

III. EXPENDITURES FOR AND DURING THE YEAR ENDED JUNE 30, 1897.

(Not necessarily a balance sheet as compared with Division II above.)

1. Instruction in the subjects specified in Sect. 1, act of August 30, 1890	$31,219.74
2. Instruction in all other subjects, if any, not mentioned in question 1 of this series	490.16
3. Administrative expenses (President's, Secretary's, Treasurer's, Librarian's salaries, clerical service, fuel, light, etc.)	7,697.79
4. Experiment station	15,000.00
Total	$54,407.69

IV. PROPERTY YEAR ENDED JUNE 30, 1897.

Value of buildings, $183,881; of other equipment, $47,000. Total number of acres, 342; acres under cultivation, 28; acres used for experiments, 6; value of farm lands, $20,500; amount of all endowment funds, $41,800. Number of bound volumes, June 30, 1897, 4,600; pamphlets, 2,000.

V. FACULTY DURING THE YEAR ENDED JUNE 30, 1897.

1. College of Agriculture and Mechanic Arts:

	Males.	Females.
College and special classes . .	21	
3. Number of staff of Experiment Station	10	

VI. STUDENTS DURING THE YEAR ENDED JUNE 30, 1897.

	Males.	Females.
Collegiate and special classes . . .	67	19
Post graduate courses	2	
Total, counting none twice . .	69	19
Summer school of Biology . .	2	7
Non-resident course in Agriculture .	27	2
2. Number in all other departments .	8	
	106	28

3. Number of students that pursued courses in agriculture, 35; mechanical and electrical engineering, 34; military tactics, 52. (It is not expected that the sum of the figures will equal the number of students given above.)
4. What degrees and how many of each kind were conferred in 1896-'97?

On men, 12 B. S. 1 M. S. 13.
On women, 4 B. S. 4.

CHARLES S. MURKLAND,
President.

November, 1897.

PRESIDENT'S GOVERNMENT REPORT.

THE NEW HAMPSHIRE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS.

DURHAM, N. H., November, 1898.

Report of the president to the Secretary of the Interior and the Secretary of Agriculture, as required by act of congress of August 30, 1890, in aid of colleges of agriculture and the mechanic arts.

I. CONDITION AND PROGRESS OF THE INSTITUTION FOR THE YEAR ENDED JUNE 30, 1898, ESPECIALLY—

1. Changes in course or methods of instruction, if of sufficient importance to warrant mention.

2. Purpose, structural character, and cost of new buildings or additions to buildings.

3. Provision, both didactic and experimental, for the study of electricity and compressed air as secondary motive powers, and of electricity as a motive in nature.

1. The chief change in the courses of the institution has been an elevation of the standard, amounting to nearly one complete year's work. The requirements for admission have been raised so that students who enter must have had the equivalent of a good high school education.

Courses have been readjusted with special reference to developing the pedagogical sequence of the Agricultural courses, in the attempt to make them equal in the intellectual quality with the Engineering courses.

II. No important addition has been made to the plant.

III. No special provision has been made for the study of compressed air as a motive power. The experimental researches in electricity have not developed any results significant enough for special mention.

In general, the work of the year has been progressive, and the changes have been determined by the necessity of adjusting the college more accurately to the requirements of the state.

II. RECEIPTS FOR AND DURING THE YEAR ENDED JUNE 30, 1898.

1. Balance on hand July 1, 1897, over and above all indebtedness (excluding funded debt, if any)	$812.71
2. State aid:	
(*a*) Appropriation for current expenses	3,000.00
(*b*) Appropriation for special expenses	2,500.00
3. Federal aid:	
(*a*) Income from land grant, act of July 2, 1862	4,800.00
(*b*) Additional endowment, act of August 30, 1890	23,000.00
(*c*) For experiment stations, act of March 2, 1887	15,000.00
4. Fees and all other sources	16,254.73
Total	$65,367.44

III. EXPENDITURES FOR AND DURING THE YEAR ENDED JUNE 30, 1898.

(Not necessarily a balance sheet as compared with Division II above.)

1. Instruction in the subjects specified in Sect. 1, act of August 30, 1890	$22,398.74
2. Instruction in all other subjects, if any, not mentioned in question 1 of this series	448.54
3. Administrative expenses (President's, Secretary's, Treasurer's, Librarian's salaries, clerical service, fuel, light, etc.)	25,833.28
4. Experiment station	15,000.00
Total	$63,680.56

IV. PROPERTY YEAR ENDED JUNE 30, 1898.

Value of all buildings, $184,016.24; of all other equipment, $55,500. Total number of acres, 342; acres under cultivation, 20; acres used for experiments, 6; value of farm lands, $20,500; amount of all endowment funds, $41,800. Number of bound volumes June 30, 1898, 5,646; pamphlets, 3,700.

V. FACULTY DURING THE YEAR ENDED JUNE 30, 1898.

		Males.	Females.
1.	College of Agriculture and Mechanic Arts:		
	(*a*) Preparatory classes . . .	12	
	(*b*) Collegiate and special classes .	18	
	(*c*) Total counting none twice .	21	
2.	Number in all other departments (excepting duplicates)—additional experiment station officials . .	5	
3.	Number of staff of Experiment Station	11	

VI. STUDENTS DURING THE YEAR ENDED JUNE 30, 1898.

		Males.	Females.
1.	College of Agriculture and Mechanic Arts:		
	(*a*) Preparatory classes . . .	7	
	(*b*) Collegiate and special classes .	88	46
	(*c*) Post graduate courses . .	2	
	Total counting none twice . .	97	46
2.	Number in all other departments .	..	..

3. Number of students who pursued courses in agriculture, 44; mechanical engineering, 38; electrical engineering, 2; military tactics, 73.

4. What degrees and how many of each kind were conferred in 1897-'98?

On men,	16 B. S.	1 M. S.	17.
On women,	3 B. S.		3.

CHARLES S. MURKLAND,
President.

November, 1898.

CATALOGUE.

BOARD OF TRUSTEES.

HON. GEORGE A. WASON, New Boston, *President.*
HIS EXCELLENCY GOV. GEORGE A. RAMSDELL, *ex officio.*
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HON. JOHN W. SANBORN, Wakefield.
JEREMIAH W. SANBORN, M. S., Gilmanton.
ROSECRANS W. PILLSBURY, ESQ., Londonderry.

HON. WALTER M. PARKER, Manchester, *Treasurer.*

FOUNDATION AND ENDOWMENT.

At the session of the legislature of New Hampshire in 1866, an act was passed establishing the "New Hampshire College of Agriculture and the Mechanic Arts" on the basis of the congressional land grant, and authorizing its location in Hanover and in connection with Dartmouth College.

In accordance with this act, the institution was organized, under a board of trustees appointed partly by the governor and council and partly by the corporation of Dartmouth College.

The act of congress, by virtue of which it was established, provides that its "leading objects shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts . . . in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

An act of congress, approved August 30, 1890, provides an additional appropriation, which for the current year is twenty-four thousand dollars. This money is to be applied "to instruction in Agriculture, the Mechanic Arts, the English Language, and the various branches of Mathematical, Physical, Natural, and Economic Science, with special reference to their applications in the industries of life, and to the facilities for such instruction."

At the session of the legislature of New Hampshire in 1891, acts were passed severing the connection with Dartmouth College, removing the New Hampshire College from Hanover to Durham, accepting the Benjamin Thompson estate, and providing one hundred thousand dollars to be used with certain other sums in the erection of buildings.

The Benjamin Thompson estate was then of the value of about four hundred thousand dollars. Accumulating at four per cent compound interest, it will be available as an endowment in 1910.

At the session of the legislature of New Hampshire in 1893, an act was passed appropriating thirty-five thousand dollars for completing and furnishing the buildings. These buildings have been finished, furnished, and supplied with apparatus. The New Hampshire College has completed the fifth year of work in its new location.

The college is carrying out the provisions of the acts of congress, by giving a practical and scientific education which is of use in all the professions and industrial pursuits, by means of the following courses of study:

1. Courses in Agriculture:
    - A. Four Years' Course.
    - B. Two Years' Course.
    - C. Ten Weeks' Winter Course.
    - D. Ten Weeks' Dairy Course.
    - E. Non-resident Course.
2. Courses in the Mechanic Arts:
    - A. Mechanical Engineering Course.
    - B. Electrical Engineering Course.
    - C. Technical Chemistry Course.
3. General Course.
4. Preparatory Course.

FACULTY.

CHARLES S. MURKLAND, A. M., PH. D., *President and Professor of English Language and Literature.*

CHARLES H. PETTEE, A. M., C. E., *Dean and Professor of Mathematics and Civil Engineering.*

CLARENCE W. SCOTT, A. M., *Professor of History and Political Economy.*

FRED W. MORSE, B. S., *Professor of Organic Chemistry.*

CHARLES L. PARSONS, B. S., *Professor of General and Analytical Chemistry.*

CLARENCE M. WEED, D. SC., *Professor of Zoölogy and Entomology.*

ALBERT KINGSBURY, M. E., *Professor of Mechanical Engineering.*

FRANK WILLIAM RANE, B. AG., M. S., *Professor of Horticulture.*

*HOLLIS C. CLARK, 1ST LIEUT. 23D INFANTRY, *Professor of Military Science and Tactics.*

CHARLES W. BURKETT, M. SC., *Associate Professor of Agriculture.*

HERBERT H. LAMSON, M. D., *Instructor in Botany.*

ARTHUR F. NESBIT, A. M., B. S., *Instructor in Physics and Electrical Engineering.*

†CHARLES H. KINNE, PH. D., *Instructor in Modern Languages.*

HENRY D. HUNT, B. PH., *Instructor in Modern Languages.*

JOSEPH H. HAWES, *Instructor in Drawing.*

ELLIS W. LAZELL, PH. D., *Instructor in Chemistry and Mineralogy.*

JOHN N. BROWN, *Foreman of Machine Work.*

GEORGE H. FURBISH, *Foreman of Wood Work.*

* Ordered to serve with his regiment, June, 1898.
† Absent on leave.

C. H. WATERHOUSE, *Instructor in Dairying and Superintendent of Creamery.*
ELWIN H. FORRISTALL, B. S., *Assistant in Agriculture.*
EDWARD E. RUSSELL, *Engineer and Curator of Buildings.*
CLEMENT S. MORRIS, *Purchasing Agent.*

STUDENTS.

a—Agricultural Course; *c*—Course in Technical Chemistry; *e-e*—Electrical Engineering Course; *g*—General Course; *m-e*—Mechanical Engineering Course. Sophomores and Juniors in the Engineering Courses are designated by *e* only. Freshmen are not classified in courses.

GRADUATE STUDENT.

Name.	Residence.	Subject.
Dearborn, Ned,	*Tilton.*	Biology.
M. S., N. H. College, 1898.		

UNDERGRADUATE.

SENIORS.

Name.	Residence.	Room.
Barnard, Harry Everett *c*	*Nashua.*	The Nashuway.
Clement, Harrison Edward *m*	*Nashua.*	Prof. Scott's.
Colby, Irving Atwell *m e* *	*Exeter.*	The Nashuway.
Chase, Frank Rufus *g* *	*Epping.*	Dr. Grant's.
Hayden, Willis Daniel Farley *a*	*Hollis.*	DeMeritt Hall.
Horton, Frederic Libbey, *e e*	*Dover.*	Mr. A. Meserve's.
Hunt, William Elmer *e*	*Nashua.*	The Nashuway.
Kenney, Lewis Hobart *m e*	*Pownal, Me.*	Q. T. V. Hall.
Mark, Grace Agnes *g*	*Gilsum.*	Mr. Waterhouse's.
Norcross, Arthur Zebulon *a*	*Rindge.*	The Nashuway.
Putney, Harry Nelson *m e*	*Franklin.*	Hoitt House.
Simpson, Etta Lillian *g* *	*Durham.*	Mr. Simpson's.

JUNIORS.

Andrews, Herbert Prescott *e*	*Hollis.*	Thompson Hall.
Baker, Henry Clark *e*	*So. Yarmouth, Mass.*	DeMeritt Hall.
Burnham, Fanny *g*	*Durham.*	Mr. J. W. Burnham's.
Foye, Blanche Mary *g*	*Durham.*	Mr. A. Meserve's.
Huse, Edwin Sweetser *g*	*Milton.*	Q. T. V. Hall.
Mathes, Charles Eliot Page *g* *	*Durham.*	Mr. Mark Mathes's.
Nelson, Edward Emil *e* *	*Nashua.*	Prof. Scott's.
Penneo, George Jay *a* *	*Hampstead.*	Mr. Caverno's.

* Partial course.

Name.	Residence.	Room.
Pettee, Alvena *g*	*Durham.*	Prof. Pettee's.
Robertson, Marie Livingstone *g*	*Buffalo, N. Y.*	Prof. Parson's.
Shipley, Walter Noah *e* *	*Nashua.*	The Nashuway.
Stillings, Charles Edwin *e*	*Somersworth.*	Mr. Furbish's.
Wilson, John Ernest *e*	*Hollis.*	DeMeritt Hall.
Wright, Robert Morrill *g*	*Hill.*	Q. T. V. Hall.

SOPHOMORES.

Calderwood, Henry Harold *e*	*Nashua.*	The Nashuway.
Cleaveland, Guy Mix *g*	*Nashua.*	The Nashuway.
Courser, Charles Henry *e*	*Warner.*	Mr. A. Meserve's.
Dorr, Alice Emerson *g*	*Dover.*	Mr. Waterhouse's.
Evans, Harry Willis *e*	*Portsmouth.*	Mr. Sawyer's.
Farwell, Harry Gilbert *e*	*Keene.*	DeMeritt Hall.
George, Harry Tanton *e*	*Portsmouth.*	Mr. A. Meserve's.
Gowen, Ella Gertrude *g*	*Dover.*	Mr. Waterhouse's.
Hunt, Charles Lund *e*	*Nashua.*	The Nashuway.
Jewett, Edwin Price *e*	*Lakeport.*	Q. T. V. Hall.
Keown, Robert McArdle *e*	*Pomona, Fla.*	Thompson Hall.
Lewis, Rutherford Burchard *e*	*New York, N. Y.*	Hoitt House.
Lyon, Elmer Eugene *g*	*Wentworth.*	The Nashuway.
Roberts, John Harry *g*	*Rollinsford.*	DeMeritt Hall.
Rollins, Norman Allen *e*	*Concord.*	Q. T. V. Hall.
Runlett, Harold Morrison *g*	*Durham.*	Mr. Runlett's.
Staniels, Charles Tuttle *e*	*Concord.*	Nesmyth Hall.
Thompson, Alfred Giles *e*	*Franklin Falls.*	Q. T. V. Hall.

FRESHMEN.

Andrews, Charles Pearl	*Somersworth.*	Somersworth.
Buzzell, Maurice Tuttle	*Lee.*	Mr. James Buzzell's.
Church, John Edwin	*Durham.*	Mr. Andrew's.
Cook, James Nelson	*Center Harbor.*	Q. T. V. Hall.
Dickerman, Albert Cornell	*New Hampton.*	Q. T. V. Hall.
Doe, Mary	*Salmon Falls.*	Mr. Waterhouse's.
Edgerly, Benjamin George	*Wolfeborough.*	Dr. Grant's.
Gilmartin, Edwin W.	*Nashua.*	The Nashuway.
Grover, Fred Howard	*Portsmouth.*	Mr. A. Meserve's.
Kendall, John Chester	*Peterborough.*	Whitcher's Block.
Knowles, Albert Cate	*Epsom.*	DeMeritt Hall.
Lee, Harry Moulton	*Moultonborough.*	Q. T. V. Hall.
Livermore, Abiel Abbott	*Wilton.*	The Nashuway.
Martin, Charles Wesley	*Durham.*	Mrs. Hadley's.

* Partial course.

Name.	Residence.	Room.
Merrill, George Enoch	*Hampton Falls.*	Dover.
Metz, Walter C.	*Newark, O.*	Whitcher's Block.
Parker, Gerry Flint	*Litchfield.*	The Nashuway.
Payne, Charles Albert	*Portsmouth.*	Mr. A. Meserve's.
Runlett, Eugene Pierce	*Durham.*	Mr. Runlett's.
Saben, Delano Morey	*Winchester.*	Mr. A. Meserve's.
Sargent, Carl Linwood	*Penacook.*	Q. T. V. Hall.
Sanders, Frank Reed	*Laconia.*	Q. T. V. Hall.
Strout, Harry Herrick	*Durham, Me.*	Q. T. V. Hall.
Sullivan, Arthur Lyon	*Suncook.*	DeMeritt Hall.
Tasker, Charles Norris	*Dover.*	Dover.
Twombly, Winfield Hancock	*Madbury.*	DeMeritt Hall.
Weeks, Carrie T.	*Greenland.*	Mr. Waterhouse's.

TWO YEARS' COURSE.

FIRST YEAR.

Durell, Fred Joseph	*Newmarket.*	Newmarket.
Elliot, Harry Alvin	*Hanover.*	Mrs. Hadley's.
Hill, Edwin Butler	*Pelham.*	Mrs. Thompson's.
Hills, Edward Augustus	*Hollis.*	DeMeritt Hall.
Stone, Hayes Wilson	*Claremont.*	Mrs. Hadley's.

PREPARATORY COURSE.

Beard, Morris Lyon	*Durham.*	Mr. Beard's.
Brown, Frank Ray	*Durham.*	Mr. Brown's.
Conner, Alfred	*Newfields.*	Newfields.
Dearborn, Jenness Stevens	*Suncook.*	DeMeritt Hall.
Merrill, James Cushing, Jr.	*Haverhill, Mass.*	DeMeritt Hall.
Otis, Albert Noah	*Durham.*	Mr. Geo. D. Stevens's.
Watson, David Albert	*Durham.*	Mr. David Watson's.

SPECIAL STUDENTS.

Name.	Residence.	Subject.
Byrne, John J.	*Durham.*	Drawing.
Fiske, William F.	*Mast Yard.*	Biology.
George, Grace Ida	*Newmarket.*	French.
Hadley, F. L.	*Durham.*	Shop Work.
Hadley, Nellie G.	*Durham.*	Drawing.
Harvey, Anna M.	*Newmarket.*	Biology.
Little, Edwin Dearborn	*Salisbury.*	Shop Work.
Pratt, Walter D.	*Boston, Mass.*	English, Chemistry.
Whidden, Ernest Cooper	*Dover.*	Shop Work.
Lilico, Thomas Gordon	*Dover.*	Bacteriology.

M. R. C. Y. S. (London, England).

DAIRY STUDENTS.

Name.	Residence.
Hardy, E. B.	*Boscawen, New Hampshire.*
Moriarty, Charles	*Durham, New Hampshire.*
Penney, T. C.	*Portsmouth, New Hampshire.*
Stowell, George Abner	*Claremont, New Hampshire.*
Smith, Bertie E.	*Sullivan, New Hampshire.*

NON-RESIDENT COURSE IN AGRICULTURE.

Name.	Residence.
Richardson, Elliott M.	*Peterborough, New Hampshire.*
Fernald, William L.	*Eliot, Maine.*
Osborne, Alfred	*North Weare, New Hampshire.*

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ADMISSION.

All candidates for admission to college must present satisfactory testimonials of good moral character.

Candidates for the Freshman class are examined in the following subjects:

I. Arithmetic, including the metric system.

II. Algebra through quadratic equations, including radicals, and fractional and negative exponents.

III. Plane Geometry.

IV. Physics.—Gage's Introduction to Physical Science, or Dolbear's Natural Philosophy, or an equivalent.

V. Botany.—Gray's Lessons, sections 1 to 15 (inclusive), and sections 18 and 19, or an equivalent, with some knowledge of classification, and experience in the analysis of our common flowering plants.

VI. Physical Geography.

VII. History of the United States.—Fiske's, or Johnston's, or an equivalent.

VIII. History of Greece.—Myers's larger work, or an equivalent.

IX. History of Rome.—Allen's Roman People, or an equivalent.

X. French.—Grammar: Translation of easy prose at sight.

XI. English.—Two sets of books are prescribed for preparation in English, one for reading, the other for more careful study. No candidate will be admitted whose work is notably defective in points of spelling, punctuation, idiom, or division into paragraphs. The examination will consist of two parts:

1. Reading.—A certain number of books will be set for reading. The candidate will be required to present evidence

of a general knowledge of the subject matter, and to answer simple questions on the lives of the authors. The form of examination will usually be the writing of a paragraph or two on each of several topics to be chosen by the candidate from a considerable number—perhaps ten or fifteen—set before him in the examination paper. The treatment of these topics is designed to test the candidate's power of clear and accurate expression, and will call for only a general knowledge of the substance of the books. In place of a part or the whole of this test, the candidate may present an exercise book, properly certified by his instructor, containing compositions or other written work done in connection with the reading of the book. In preparation for this part of the requirement it is important that the candidate shall have been instructed in the fundamental principles of rhetoric.

The books set for this part of the examination will be:

In 1899, Pope's Iliad, Books I, VI, XXII, and XXIV; Dryden's Palamon and Arcite; the Sir Roger de Coverley Papers in "The Spectator"; Goldsmith's Vicar of Wakefield; Coleridge's Ancient Mariner; De Quincey's Flight of a Tartar Tribe; Lowell's Vision of Sir Launfal; Hawthorne's House of the Seven Gables; Cooper's Last of the Mohicans.

In 1900, Dryden's Palamon and Arcite; Pope's Iliad, Books I, VI, XXII, and XXIV; The Sir Roger de Coverley Papers in "The Spectator"; Goldsmith's Vicar of Wakefield; De Quincey's Flight of a Tartar Tribe; Tennyson's Princess; Scott's Ivanhoe; Cooper's Last of the Mohicans; Lowell's Vision of Sir Launfal.

In 1901, Pope's Iliad, Books I, VI, XXII, and XXIV; The Sir Roger de Coverley Papers in "The Spectator"; Goldsmith's Vicar of Wakefield; Tennyson's Princess; Scott's Ivanhoe; Cooper's Last of the Mohicans; George Eliot's Silas Marner; Coleridge's Rime of the Ancient Mariner; Shakespeare's Merchant of Venice.

2. Study and Practice.—This part of the examination presupposes the thorough study of each of the works named in this division. In addition the candidate may be required to answer questions involving the essentials of English grammar and composition. Inability to answer such questions will be considered a sufficient ground for refusing admission.

The books set for this part of the examination will be:

In 1899, Shakespeare's Macbeth; Milton's Paradise Lost, Books I and II; Burke's Speech on Conciliation with America; Carlyle's Essay on Burns.

In 1900, Shakespeare's Macbeth; Milton's Paradise Lost, Books I and II; Burke's Speech on Conciliation with America; Macaulay's Essays on Milton and Addison.

In 1901, Shakespeare's Macbeth; Burke's Speech on Conciliation with America; Macaulay's Essays on Milton and Addison; Milton's L'Allegro, Il Penseroso, and Comus.

Candidates for admission to the Preparatory class are examined in Arithmetic, including the metric system; Algebra to quadratics, not including radicals; English Grammar and Composition; Physical Geography, and the History of the United States.

Admission will be refused to candidates failing in English, or showing marked deficiencies in spelling and punctuation.

Candidates for admission to the Two Years' Course in Agriculture are examined in Arithmetic, English Grammar (including spelling and writing), and the Geography and History of the United States.

Candidates for advanced standing are also examined in the studies that have been pursued by the class which they propose to enter.

A certificate from an academy or a high school will be accepted in place of an examination, upon any subject required for admission. Every certificate must state the amount of work done by the student, his proficiency, and the text-books used; and in case it is not evident that the student is thoroughly prepared, an examination will be required.

Certificate forms will be furnished on application.

The times for examination are the Monday and Tuesday before Commencement, and the Tuesday and Wednesday before the beginning of the first term. Candidates will first present themselves with their credentials on the first day of the examination. See Calendar.

DESCRIPTION OF STUDIES.

For the Courses of Study see page 32 et seq.

AGRICULTURE.

1. Elementary Agriculture. *Sixty exercises.*

Lectures, recitations, and practical exercises on the fundamental principles of general agriculture. This course forms the foundation for the courses that follow it. (Short course in agriculture.)

2. Dairying. *Fifty exercises.*

Practice and occasional lectures. The course consists in the general management of modern dairying, the methods of milk analysis, the bacteriology of milk, the use of separators, the making of butter, and preparation of milk for the city market. (Short course in agriculture.)

3. Breeds and Breeding. *Forty exercises.*

Lectures, recitations, and practical work. An elementary course on the practical applications of the laws of inheritance, including the scoring, judging, and studying of breeds of live stock. (Short course in agriculture.)

4. Soils and Fertilizers. *Sixty exercises.*

Lectures, recitations upon the origin, formation, kinds, and physical properties of soils and their improvement by cultivation, natural and artificial fertilizers, drainage and irrigation. Practical exercises in testing physical properties of several soils, determining the relation of soils to heat, moisture, air, and fertilizers, and making mechanical analysis.

5. Stock Feeding and Hygiene. *Forty exercises.*

Lectures and recitations upon the laws of nutrition, the character of food stuffs, the relation of foods to animals, and the kind and quality of foods to produce certain results. Practical exercises in calculating digestibility, nutritive ratios, and feeding standards.

6. Farm Equipment. *Thirty exercises.*

Lectures and recitations upon selecting, planning, and equipping farms; planning and erecting farm buildings; farm vehicles and machinery; power, water, and drainage; practical exercises in drawing plans of farms and farm buildings; leveling and laying drains; dynamometer tests of wagons and farm implements, etc.

7. Farm Crops. *Thirty exercises.*

Lectures and recitations upon the history, production, marketing, and harvesting of farm crops. Practical exercises with growing and dried specimens of farm crops, including grasses, clovers, and other forage crops.

8. Agricultural Seminary. *Thirty exercises.*

This course consists of the study of current agricultural literature. Each student will prepare abstracts, reports, or essays upon assigned articles, books, bulletins, and various agricultural problems.

9. Breeds of Live Stock. *Forty-five exercises.*

Lectures and recitations upon the history, characteristics, care, adaptation, and management of the different breeds of live stock. Practical exercises are given in scoring and judging the various kinds of live stock with use of the score card.

10. Dairying. *Thirty exercises.*

Practical exercises in running the separator, churning, and making butter, and testing, pasteurizing, and analyzing milk.

11. Principles of Breeding. *Thirty exercises.*

Lectures and recitations upon the laws of inheritance and their practical application. Practical exercises in scoring and judging live stock, and in writing and tracing pedigrees.

12. History of Agriculture and Rural Economics. *Twenty exercises.*

Lectures upon the history of agriculture; present agricultural methods in various countries; cost and relative profits of various farm operations and systems.

BOTANY.

1. Structural Botany. *Thirty exercises.*

Lectures and laboratory work on the minute structure and physiology of plants, with special reference to the higher forms.

Open only to those who have taken the preparatory Botany or its equivalent.

2. Plant Diseases. *Twenty exercises.*

A study by means of lectures and laboratory work of some of the more important fungous diseases of cultivated plants, and the means of preventing their injuries.

Open only to students who have completed Botany 1.

3. Advanced Course.

a. Forty-five exercises. b. Thirty exercises. c. Thirty exercises.

Open only to those who have shown special proficiency in Botany.

CHEMISTRY.

1. Inorganic Chemistry. *Forty-five exercises.*

Lectures and recitations on general theoretical chemistry, illustrated by experiments, charts, specimens, lantern views, etc. Solutions of chemical problems will be required.

2. Inorganic Chemistry. *Thirty exercises.*

Course 2 is a continuation of Course 1, but the time will be spent mainly on the metallic elements, their metallurgy, salts, etc.

Open only to students who have completed Course 1.

3. Organic Chemistry. *Twenty exercises.*

Course 3 will consist of lectures and recitations on the chemistry of the carbon compounds, together with the study of their properties by means of specimens.

Open only to students who have completed Courses 1 and 2.

4. Qualitative Chemical Analysis.

Course 4 consists of laboratory practice, with occasional lectures. The student is expected to become proficient in the separation and detection of the common acids and bases, and to keep a full set of notes. He will have practice in the writing of reactions, and will fill out numerous slips containing questions bearing upon his work.

Open only to students who have completed Courses 1 and 2.

5*a*. Chemistry of Plant Growth. *Forty-five exercises.*

The composition of plants at different stages of growth, and the conditions necessary for their development. This subject must be preceded by Chemistry Courses 1, 2, and 3.

5*b*. Food and Nutrition. *Twenty exercises.*

These subjects include the composition of foods, and the animal body; the assimilation of the former by the latter, and the

principles underlying a rational diet. This subject should be preceded by Course 5*a*.

6. Applied or Industrial Chemistry.

a. Twenty exercises. *b. Twenty exercises.*

Course 6 consists of lectures on chemical manufactures, such as iron, steel, sugar, sodium carbonate, fertilizers, sulphuric acid, glass, matches, paints, dyes, soaps, illuminating gas, petroleum, etc. The lectures will be illustrated by lantern views; and trips to the leading New England cities, to examine important chemical manufactures, will be taken as far as practicable.

Open only to those who have completed Courses 1, 2, 3, 4.

7. Advanced Quantitative Analysis.

Course 7 extends through the year, and is intended to fit the student for work in the laboratories of agricultural experiment stations, fertilizer works, iron-works, sugar refineries, etc., and for the duties of the public analyst. This course will be made to fit the end which each has in view, and will be largely an individual one. For those students in the Chemical Division of the Agricultural Course the analyses made will tend in the main toward agricultural products, fertilizers, mucks, marls, manures, dairy products, waters, food-stuffs, sugars, etc. For the student wishing to enter metallurgical works, the analyses will be in the main upon iron, steel, and other metals, ores, limestone, slags, alloys, fuels, etc. As a preparation for the study of medicine, work will be done on poisons, foods, drugs, urine, etc. Other lines will be arranged to meet the wants of the individual student. Each student will be given some practice in all of the branches of agricultural, metallurgical, medical, sanitary, and industrial chemistry, in order to lay a foundation for any future work which may be required of him. A short course in gas analysis will also be provided. A portion of the time of the last two terms is given to work bearing upon the preparation of a graduating thesis.

Open to students who have completed Course 4.

8. Organic Chemistry. *Thirty exercises.*

Course 8, for students in the Chemical Division of the Agricultural Course, and in the Technical Chemistry Course, consists of laboratory practice by the students in preparing and purifying products relating to their respective lines of work.

Open to those who have completed Course 3.

9. Chemical Journals, Methods, etc. *Thirty-five exercises.*

The work consists of the study of current chemical literature, which is mainly in the German language, with recitations once a week throughout the year. Each student will be expected to prepare abstracts, reports, criticisms, etc., upon assigned articles.

Open to students taking Course 7.

10. Chemical Philosophy. Lectures and Recitations.

a. Twenty exercises. *b. Twenty exercises.*

The work consists of advanced study of chemical theory. Practical experiments will be performed, with the aid of the student, in the determination of vapor density, molecular weights, specific heat, etc.; and the study of isomorphism, diffusion of gases, solutions, molecular and atomic volume, etc., will take up much of the time.

Course 10 comes in alternate years with Course 6, and is open to students who have completed Courses 1, 2, and 3.

DRAWING.

Two and one half hours' work is reckoned as one exercise.

1. Freehand and Instrumental Drawing.

a. Thirty exercises. *b. Twenty exercises.*

Course for women.

c. Seventy-five exercises. *d. Fifty exercises.*

Freehand drawing in outline and in light and shade, from geometric models, common objects, and casts of historic ornament. Machine sketching and the use of instruments.

2. Freehand and Instrumental Drawing.

a. Twenty exercises. *b. Thirty exercises.*

Light and shade drawing from the cast and from still life; pencil sketching; design details of building construction; projection drawing.

3. Descriptive Geometry and Drawing.

a. Thirty exercises. *b. Twenty exercises.* *c. Thirty exercises.*

Recitations and drawing exercises in the solution of problems in plane and solid geometry, by means of orthographic projections.

Course 3 is open only to those who have taken Mathematics 2.

4. Mechanical drawing.

a. Twenty exercises.

Recitations on shades and shadows and perspective, with exercises in perspective drawing and line shading.

b. Thirty exercises.

Exercises in making dimension drawings for the use of workmen; tracing and blue-printing.

5. Freehand and Instrumental Drawing.

a. Forty-five exercises. b. Fifty exercises. c. Thirty exercises.

Study of architectural detail; design; use of color; pencil sketching; perspective; historic ornament.

6. Drawing and History of Painting.

a. Forty-five exercises. b. Thirty exercises. c. Thirty exercises.

This course includes the drawing of antique figure from casts, pencil sketching, charcoal drawing, use of water colors, and the study of the history of painting.

ENGINEERING.

1. Surveying. *Fifty exercises.*

Recitations, field work, and plotting, including compass, transit, plane-table, and level work.

2. Mechanism. *Forty-five exercises.*

Recitations, and exercises in drawing outlines of elementary combinations of parts of machines, with special reference to the relative motion of the parts, their forms and modes of connection.

Course 2 is open only to those who have taken Drawing 3.

3. Mechanics of Engineering.

a. Thirty exercises. b. Fifty exercises. c. Fifty exercises.

Courses 3 a and 3 b are devoted to recitations in Statics and Dynamics; Course 3 c to Mechanics of Materials.

Course 3 is open only to those who have taken Mathematics 1 to 5, inclusive.

4. Materials of Construction. *Sixty exercises.*

Recitations on the production, properties, uses, and preservation of engineering materials.

Course 4 is open only to those who have taken Course 3 c and Chemistry 2.

5. Thermodynamics.

a. Forty-five exercises. *b. Thirty exercises.*

Course 5 is open only to those who have taken Courses 3 a, 3 b, and Physics 1 and 2.

6. Heat Motors. *Thirty exercises.*

Course 6 is open only to those who have taken Course 5.

7. Construction and Theory of Dynamos and Electromotors. *Forty-five exercises.*

Lectures and quizzes.

Course 7 is open only to those who have taken Physics 1 to 4 and Mathematics 1 to 5.

8. Work in Mechanical Laboratory.

a and *b*. Tests of Materials.

a. Thirty exercises. *b. Thirty exercises.*

c. Tests of Boilers and Engines. *Twenty exercises.*

Courses 8 a and 8 b are open only to those who have taken Course 3 c. Course 8 c is open only to those who have taken Course 5.

9. Machine design. *Forty exercises.*

Course 9 is open only to those who have taken Courses 3 and 4.

10. Applications of Electricity.

a. Forty exercises. *b. Thirty exercises.*

Lectures and recitations.

Course 10 is open only to those who have taken Physics 1, 2, 3, and 4.

11. Roads, Streets, and Pavements. *Thirty exercises.*

Recitations and lectures on construction and maintenance of paved, macadamized, and gravel roads, with discussion of laws relating thereto.

ENGLISH.

1. Rhetoric.

a. Thirty exercises. b. Twenty exercises. c. Twenty exercises.

2. Three Themes. *One each term.*

Required of all students registered in the Sophomore class.

3. Three Original Declamations. *One each term.*

Required of all students registered in the Junior class.

4. Three Original Declamations. *One each term.*

Required of all students registered in the Senior class.

5. Early English. *Forty-five exercises.*

Study of authors.

6. Elizabethan Writers. *Twenty exercises.*

Study of authors.

7. Writers of the Restoration and the French Influence. *Twenty exercises.*

8. Victorian Writers. *Forty-five exercises.*

9. English Romance. *Twenty exercises.*

10. American Literature. *Forty exercises.*

Lectures and study of authors.

11. Study of Words. *Twenty exercises.*

12. Advanced Rhetoric. *Twenty exercises.*

FRENCH.

1. Writers of the Nineteenth Century. *Forty-five exercises.*

Sketches from travelers; sight translations. Feuillet, Mérimée, Dumas.

2. The Modern Drama. *Thirty exercises.*

French composition and grammar. Selections from Scribe, Victor Hugo, Sandeau; the text will be made the basis of exercises in conversation.

3. French History and Popular Science. *Thirty exercises.*

The aim is to increase the student's vocabulary of practical if not strictly scientific, subjects.

4. Systematic Vocabularies. *Forty-five exercises.*

The French verb; modern writers. Words will be studied in classes, and the common expressions of every day life made familiar.

5. Idiomatic French. *Thirty exercises.*

Eighteenth Century writers, with French and English exercises on as large a number of idioms as time permits.

6. La Fontaine, Racine, Molière. *Thirty exercises.*

Translations in class supplemented by outside reading, on which the student will be examined.

GEOLOGY.

1. Elementary Geology. *Thirty exercises.*

2. Mineralogy. *Thirty exercises.*

A short course in blowpipe analysis, followed by laboratory practice in the determination and study of minerals, with special reference to their economic value.

Course 2 is open only to students who have taken Chemistry 1 and 2.

GERMAN.

1. German Grammar. *Forty-five exercises.*

Declension of nouns and adjectives; regular and irregular verbs; oral drill; written exercises.

2. Readings for Beginners. *Thirty exercises.*

German composition; critical study of verbs. Carefully graded selections of such a character as gradually to meet and master the difficulties of German syntax.

3. German Prose of the Nineteenth Century. *Thirty exercises.*

Conversation. Variety of vocabulary, and the mastery of the more common idioms, will be the aim of this Course.

4. German Prose of the Nineteenth Century, Continued. *Forty-five exercises.*

Grammar and composition. Review of the verb; selections from German newspapers. More difficult selections; sight translations.

5. German Plays, History, and Travel. *Thirty exercises.*

Conversational style adapted to oral drill in class. Selections from a large number of modern writers.

6. Scientific German. *Thirty exercises.*

The purpose of the Course is to familiarize the student with the vocabulary of scientific investigation.

7. German Prose Composition.

The work of some German author will be translated with the view of using the text as the basis for exercises in German prose composition. History of the literature.

8. Systematic Vocabularies.

A drill on the words and expressions of most frequent recurrence. Conversation continued.

9. Masterpieces of German Literature in connection with historical references.

Lessing, Goethe, Schiller.

The aim throughout the courses in French and German will be the discipline derived from their study and to make these languages thoroughly practical.

HISTORY.

In the courses in history an important place is given to historical reading carried on in the reference room. In some cases a considerable part of the work is written. Special attention is paid to the development of arts and institutions.

1. Mediaeval and Modern History to the beginning of the Seventeenth Century. *Sixty exercises.*

2. Modern History from the beginning of the Seventeenth Century to the French Revolution. *Thirty exercises.*

3. European Political History since the beginning of the French Revolution. *Thirty exercises.*

4. American History to 1825. *Sixty exercises.*

5. American Political History since 1825. *Thirty exercises.*

HORTICULTURE.

1. Principles of Plant Growth. *Forty-five exercises.*

This course is elementary and points out the fundamentals of horticulture. (Short course in agriculture.)

2. Elementary Horticulture. *Fifty exercises.*

Lectures and practice in laboratory, greenhouse, orchard, and ornamental grounds. A study of preparation of soil, drainage, and irrigation, fertilizers, tools, implements, and buildings. Propagation, multiplication, germination, transplanting, budding, grafting, and pollinating. (Short course in agriculture.)

3. Olericulture and Seed Growing. *Forty-five exercises.*

Lectures and recitations. References: Green's Vegetable Gardening, Henderson's Gardening for Profit, Brill's Seed Growing, and various special pamphlets.

Open only to those having completed Botany 1.

4. Arboriculture and Forestry. *Twenty exercises.*

The use of trees for shelter, shade, and ornament, and their propagation. Value of trees for timber. How to improve existing woodlands. Influence of forests upon soils, crops, and climate. Establishment and management of plantations of forest trees.

5. Winter Gardening. *Twenty exercises.*

The construction and management of greenhouses; crops of the vegetable forcing-house. References: Bailey's Forcing Crops; Taft's Greenhouse Construction.

6. Pomology and Viticulture. *Forty-five exercises.*

References: Downing's Fruit and Fruit Trees of America, Thomas's American Fruit Culturist, Barry's Fruit Garden, Fuller's Small Fruit Culturist.

Open only to those having completed Botany 2 and Zoölogy 3.

7. Horticultural Seminary. *Twenty exercises.*

Discussion of current literature; experiment station bulletins, and a study of various horticultural problems.

8. Horticultural Seminary. *Twenty exercises.*

A continuation of Course 6, together with practice in journalism.

9. Landscape Gardening and Floriculture. *Twenty exercises.*

The principles of aesthetics as applied to natural scenery; the adornment of home grounds, including management of house plants, climbing vines, and flowering bulbs.

MATHEMATICS.

1. Algebra completed. *Fifty exercises.*
2. Solid Geometry, with advanced course. *Fifty exercises.*
3. Plane and Spherical Trigonometry. *Fifty exercises.*
4. Analytic Geometry. *Seventy-five exercises.*

5. (*a*) Differential Calculus, (*b*) Integral Calculus.

One hundred exercises.

6. Astronomy. *Forty exercises.*

METEOROLOGY.

1. Meteorology. *Thirty exercises.*

Recitations and lectures on wind systems, precipitation, humidity, laws of storms and tornadoes, and methods of prediction of atmospheric changes.

MILITARY SCIENCE AND TACTICS.

1. Military Drill.

Practical instruction in drill and gymnastic exercises.
Four exercises per week throughout the course.

2. Military Tactics.

Theoretical instruction in drill regulations and the elementary principles of military science.
One exercise per week throughout the Freshman, Sophomore, and Junior years.

PHILOSOPHY.

1. Logic. *Thirty exercises.*

Lectures and recitations.

2. Psychology. *Forty-five exercises.*

Open only to students who have obtained a high average in Course 1.

3. Ethics. *Thirty exercises.*

Lectures and recitations.
Open only to students who have obtained a high average in Courses 1 and 2.

4. Elements of Philosophy. *Thirty exercises.*

Open only to students who have obtained a high average in Courses 1 and 2.

5. History of Philosophy. *Sixty exercises.*

Open only to students who have obtained a high average in Courses 1, 2, 3, and 4.

PHYSICS.

1. Mechanics. *Thirty exercises.*

2. (*a*) Heat, (*b*) Light. *Forty-five exercises.*

3. Sound. *Twenty exercises.*

4. Electricity and Magnetism. *Forty exercises.*

Courses 1, 2, 3, and 4 are a general introduction to the subject. The instruction is given by recitations and lectures, the latter being illustrated by experiments and stereopticon. Notes on lectures and experiments are submitted by each student.

5. Laboratory Work in Mechanics and Heat. *Forty-five exercises.*

6. Laboratory Work in Light and Sound. *Thirty exercises.*

7. Laboratory Work in Electricity and Magnetism. *Thirty exercises.*

The work consists in the experimental verification of the laws of physics and the determination of physical constants; for example, the student will by experiments investigate the intensity of gravity, co-efficients of friction, the analytical balance, elasticity of wires, specific heats, laws of radiation and absorption of heat, candle power of lights, dip, declination, and intensity of the earth's magnetism, laws of electric currents, of electro-magnets, etc. A systematic and carefully written report on each experiment is required.

Courses 5, 6, and 7 are taken consecutively and are open only to those who have passed in Courses 1, 2, 3, and 4. Students in Engineering must also have passed in Mathematics 1 to 5, inclusive.

8. Theoretical Electricity.

a. Forty exercises. *b. Thirty exercises.*

This course includes the subjects of electrostatics, magnetism, and electro-dynamics as treated mathematically.

Course 8 is open only to those who have passed in Courses 1 to 7.

9. Electrical Measurements. *Thirty exercises.*

The work will include the study of the principles and methods employed in electrical measurements,—such as resistance of wires and batteries, E. M. F. of batteries, current measurement by ammeter and electrolysis, use of the voltmeter, etc.

See also Engineering.

POLITICAL SCIENCE.

1. Political Economy. *Fifty exercises.*

An elementary course, with lectures upon some of the practical questions of the day.

2. Laws of Business. *Thirty-three exercises.*

Recitations supplemented by lectures and the discussion of cases.

3. American Constitutional Law. *Forty-two exercises.*

Use is made of Pomeroy's Constitutional Law, which is supplemented by the decisions of the United States Supreme Court. Special attention is given to the connection between American constitutions and American political history.

4. Advanced Political Economy. *Thirty exercises.*

A consideration of such subjects as banking, bimetallism, and tariff legislation.

Open only to those who have taken Course 1.

5. Advanced Political Economy, or Social Science. *Thirty exercises.*

Open only to those who have taken Courses 1 and 4.

6. International Law. *Thirty exercises.*

SHOP WORK.

Three hours' work in the shops is reckoned as one exercise.

1. Work in Wood Shop.

Exercises in carpentry, joinery, and pattern making.

a. Forty-five exercises. b. Thirty exercises. c. Thirty exercises.

2. Work in Machine Shop.

Exercises in bench work, machine work, and shop measurements.

a. Forty-five exercises. *b. Thirty exercises.*
c. Thirty exercises. *d. Thirty exercises.*
e. Twenty exercises. *f. Twenty exercises.*

ZOOLOGY.

1. Introductory Zoölogy. *Forty-five exercises.*

A general introduction to the study of animal life, by means of lectures and laboratory dissections of the principal types.

2. Animal Biology. *Twenty exercises.*

A general study of the nature and processes of animal life, with especial attention to heredity, variation, development, and mental powers.

Open to students who have taken Course 1.

3. Entomology. *Thirty exercises.*

A review of the classification, structural characters, and biological relations of insects, with a special study of those injurious to cultivated crops and domestic animals, and of the means of preventing their injuries.

Open only to those who have taken Courses 1 and 2.

4. Economic Ornithology. *Fifteen exercises.*

Lectures on the relations of birds to agriculture, and their relations to each other and to other organisms.

Course 4 is open only to students who have taken Courses 1, 2, and 3.

5. Comparative Anatomy. *Ten exercises.*

6. Advanced Zoölogy.
Averaging four exercises a week for a year.

Course 6 is intended for those students who elect Zoölogy for their Senior year. It will usually be modified to suit individual needs. Open only to those who have completed all preceding courses, and shown special proficiency in Zoölogy.

7. Zoölogical Bibliography. *One hour a week for a year.*

Open only to students taking Course 6.

COURSES OF STUDY AND SCHEDULE OF HOURS.

For details, see Description of Studies.

Chapel exercises: 11.50 daily, except that on Sundays the exercises are held at 5 P. M. Attendance is required of all students.

Military Drill: Military Science 1. M., T., Th., F., 12 to 12.30. Attendance is required of all students.

Rhetoricals: Wednesdays, 12 to 12.30. Attendance is required of all students.

FRESHMAN YEAR.

For all Four-Year Courses.

FIRST TERM.

	Exercises per week.
Rhetoric—English 1*a* . . . . . { Div. I. W. F. 9 / Div. II. W. F. 8 }	2
Algebra and Geometry—Mathematics 1 and 2 { Div. I. M. T. W. Th. F. S. 10 / Div. II. M. T. W. Th. F. S. 11 }	6
*Shop Work—Shop work 1*a*. W. Th. F. 1.30 to 4 . . .	3
Freehand Drawing—Drawing 1*a*. M. T. 1.30 to 4 . . .	2
French—French 1. T. Th. S. 8	3
Military Tactics—Military Science 2 . { Div. I. F. 11 / Div. II. F. 10 }	

SECOND TERM.

Rhetoric—English 1*b* . . . . { Div. I. W. F. 9 / Div. II. W. F. 8 }	2
Trigonometry—Mathematics 3 { Div. I. M. T. W. Th. F. S. 10 / Div. II. M. T. W. Th. F. S. 11 }	6
*Shop Work—Shop Work 1*b*. W. Th. F. 1.30 to 4 . . .	3
Freehand Drawing—Drawing 1*b*. M. T. 1.30 to 4 . . .	2
French—French 2. T. Th. S. 8	3
Military Tactics—Military Science 2 . { Div. I. M. 11 / Div. II. M. 10 }	

THIRD TERM.

Rhetoric—English 1*c* . . . . { Div. I. W. F. 9 / Div. II. W. F. 8 }	2
Surveying—Engineering 1. M. T. W. Th. F. 1.30 to 4 . .	5
Mechanics—Physics 1. M. W. F. 10	3
Botany—Botany 1, or †Shop Work—Shop Work 1*c*. T. Th. S. 9 to 11.50	3
French—French 3. T. Th. S. 8	3
Military Tactics—Military Science 2 . { Div. I. W. 8 / Div. II. W. 9 }	

* Women take additional Drawing and omit Shop Work.

† Shop Work is taken by students intending to complete either of the Engineering Courses, or the Course in Technical Chemistry; Botany is taken by all other students.

COURSE IN AGRICULTURE.

Sophomore Year.

FIRST TERM.

Exercises per week.

Soil Physics—Agriculture 4. T. F. 11. Th. 1.30 . . . 3
Olericulture—Horticulture 3. M. W. S. 11 2
Introductory Zoölogy—Zoölogy 1. M. W. F. 1.30 to 4 . . 3
Heat and Light—Physics 2. T. Th. S. 9 3
Inorganic Chemistry—Chemistry 1. M. W. F. 10 . . . 3
German—German 1. T. Th. S. 11 3
Military Tactics—Military Science 2. Th. 9 or 10.
One Theme—English 2.

SECOND TERM.

Stock Feeding—Agriculture 5. T. F. 11. Th. 1.30 . . 3
Arboriculture and Forestry—Horticulture 4. T. Th. 10 . 2
Animal Biology—Zoölogy 2. W. F. 1.30 to 4 2
Comparative Anatomy—Zoölogy 5. S. 8 1
Sound and Electricity—Physics 3 and 4. T. Th. S. 9 . . 3
Inorganic Chemistry—Chemistry 2. M. W. F. 10 . . . 3
German—German 2. T. Th. S. 11 3
Military Tactics—Military Science 2. Th. 9 or 10.
One Theme—English 2.

THIRD TERM.

Farm Equipment—Agriculture 6. T. F. 11. Th. 1.30 to 4 . 3
Entomology—Zoölogy 3. M. W. F. 1.30 to 4 3
Plant Diseases—Botany 2. M. W. 9 to 11 2
Organic Chemistry—Chemistry 3. M. F. 11 2
Electricity and Magnetism—Physics 4. T. Th. S. 9 . . 3
German—German 3. T. Th. S. 11 3
Military Tactics—Military Science 2. M. 11.
One Theme—English 2.

Junior Year.

FIRST TERM.

Pomology—Horticulture 6. W. 9. Th. F. 1.30 to 4 . . 3
Chemistry of Plant Growth—Chemistry. T. W. F. 8 . . 3
Ornithology—Zoölogy 4. S. 8 1
German—German 4. M. W. F. 11 3
or Am. Political History—History 4. T. Th. S. 10 to 11.50
F. 1.30 to 4 4

Chemical Laboratory—Chemistry 4. M. T. W. 1.30 to 4 . 3
Early English—English 5. M. W. F. 10 3
Military Tactics—Military Science 2. Th. S.
One Original Declamation—English 3.

SECOND TERM.

Food and Nutrition—Chemistry 5*b*. W. F. S 2
Logic—Philosophy 1. M. W. F. 10 3
Geology—Geology 1. T. Th. S. 11 3
German—German 5. M. W. F. 11 3
or Am. Political History—History 5. T. Th. S. 9 to 11 3
Chemical Laboratory—Chemistry 4. M. T. W. 1.30 to 4 . 3
Elizabethan Writers—English 6. W. F. 9 2
Military Tactics—Military Science 2.
One original declamation.

THIRD TERM.

Farm Crops—Agriculture 7. T. Th. S. 9 3
Political Economy—Political Science 1. T. W. Th. F. S. 8 . 5
English Literature—English 7. T. Th. 11 2
German—German 6. M. W. F. 11 3
or Modern History—History 3. T. Th. F. 1.30 to 4 . . 3
Mineralogy—Geology 2. M. W. F. 9 to 11 3
Military Tactics—Military Science 2. S. 11.
One original declamation—English 3.

Senior Year.

FIRST TERM.

Breeds of Live Stock—Agriculture 9. M. T. W. 1.30 . . 3
Agricultural Seminary—Agriculture 8. By appointment . 2
Laws of Business—Political Science 2 } T. W. Th. F. S. 9 5
Constitutional Law—Political Science 3 }
English Literature—English 8. T. Th. S. 10 3
Psychology—Philosophy 2. T. Th. S. 11 3
One original declamation—English 4.

SECOND TERM.

Principles of Breeding—Agriculture 11. M. T. W. 1.30 . 3
Horticultural Seminary—Horticulture 7. By appointment. 2
Dairying—Agriculture 10. By appointment. 2
International Law—Political Science 6. M. W. F. 11 . . 3
or Astronomy—Mathematics 6. T. W. Th. F. 9 . . 4

or Elements of Philosophy—Philosophy 4. T. W. Th. F. S. 9 5
Ethics—Philosophy 3. T. Th. S. 10 3
Advanced Political Science 4. T. Th. S. 11 3
One original declamation—English 4.

THIRD TERM.

Rural Economics—Agriculture 12. By appointment. . . 2
Horticultural Seminary—Horticulture 8. By appointment . 2
Landscape Gardening—Horticulture 3
*Roads—Engineering 11. M. W. F. 10 3
*American Literature—English 10. T. W. Th. F. 9 . . 4
*History of Philosophy—Philosophy 5. M. W. F. 11. S. 9 . 4
*Meteorology—Meteorology 1. T. Th. S. 10 3
*Advanced Political Economy—Political Science 5. T. Th. S. 11 3
One original declamation—English 4.

* Elect 9 hours.

BIOLOGICAL DIVISION OF THE AGRICULTURAL COURSE.

Students wishing to make a special study of the biological sciences relating to Agriculture—such as botany, entomology, and economic zoölogy—will elect in their senior year, the advanced courses in botany or zoölogy.

CHEMICAL DIVISION OF THE AGRICULTURAL COURSE.

The work in this division is intended especially to fit for the profession of an agricultural chemist—for work in experiment stations, large dairy establishments, fertilizer works, etc. Students wishing to take this course will elect, with the advice of the instructors in charge, seven hours per week of chemical work during the Junior year, and eight hours per week during the Senior year. Two years of German will be required in this course, and French is recommended to be taken by students intending to enter the division.

COURSES IN ENGINEERING.

Sophomore Year.

FIRST TERM.

	Exercises per week.
Analytic Geometry—Mathematics 4. T. W. Th. F. S. 8	5
Descriptive Geometry—Drawing 3*a*. M. W. 1.30 to 4	2
Heat and Light—Physics 2 { Div. II. T. Th. S. 9 / Div. I. T. Th. S. 10 }	3
German—German 1. T. Th. S. 11	3
Shop Work—Shop Work 2*a*. M. W. F. 9 to 11.45	3
Military Tactics—Military Science 2. Th. 9 or 10.	
One Theme—English 2.	

SECOND TERM.

Differential Calculus—Mathematics 5*a*. T. W. Th. F. S. 8	5
Descriptive Geometry—Drawing 3*b*. M. W. 1.30 to 4	2
Sound and Electricity—Physics 3 and 4 { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 }	3
German—German 2. T. Th. S. 11	3
Shop Work—Shop Work 2*b*. M. W. F. 9 to 11.45	3
Military Tactics—Military Science 2. Th. 9 or 10.	
One Theme—English 2.	

THIRD TERM.

Integral Calculus—Mathematics 5*b*. T. W. Th. F. S. 8	5
Electricity and Magnetism—Physics 4 { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 }	3
German—German 3. T. Th. S. 11	3
Descriptive Geometry and Perspective Drawing—Drawing 3*c* and 4*a*. M. T. W. Th. F. 1.30 to 4	5
Military Tactics—Military Science 2. M. 11.	
One Theme—English 2.	

Junior Year.

FIRST TERM.

Mechanics of Engineering—Engineering 3*a*. W. F. 9	2
Mechanism—Engineering 2. T. Th. S. 8 to 11	3
Inorganic Chemistry—Chemistry 1. M. W. F. 10	3
Physical Laboratory—Physics 5. M. T. W. 1.30 to 4	3
German—German 4. M. W. F. 11	3
Shop Work—Shop Work 2*d*. Th. F. 1.30 to 4	2
Military Tactics—Military Science 2. W. 8.	
One original declamation—English 3.	

SECOND TERM.

Mechanics of Engineering—Engineering 3*b*. T. W. Th. F. S. 9 5
Inorganic Chemistry—Chemistry 2. M. W. F. 10 . . . 3
Physical Laboratory—Physics 5. M. T. W. 1.30 to 4 . . 3
German—German 5. M. W. F. 11 3
Shop Work—Shop Work 2*c*. Th. F. 1.30 to 4 2
Military Tactics—Military Science 2. S. 8.
One original declamation—English 3.

THIRD TERM.

Mechanics of Engineering—Engineering 3*c*. T. W. Th. F. S. 8 5
Mineralogy—Geology 2. M. W. F. 9 to 11 3
Physical Laboratory—Physics 7. M. T. W. 1.30 to 4 . . 3
German—German 6. M. W. F. 11 3
Shop Work—Shop Work 2*f*. Th. F. 1.30 to 4 2
Military Tactics—Military Science 2. S. 11.
One original declamation—English 3.

COURSE IN MECHANICAL ENGINEERING.

SENIOR YEAR.

FIRST TERM.

Exercises per week.

Materials of Construction—Engineering 4. M. W. F. S. 11 . 4
Thermodynamics—Engineering 5*a*. M. 10. T. Th. 11 . . 3
Mechanical Drawing—Drawing 4*b*. F. S. 8 to 11 . . . 2
Mechanical Laboratory—Engineering 8*a*. Th. F. 1.30 to 4 . 2
Dynamos and Electro-Motors—Engineering 7. T. W. Th. 8 3
Chemical Laboratory—Chemistry 4. M. W. 1.30 to 4 . . 2
One original declamation—English 4.

SECOND TERM.

Machine Design—Engineering 9. M. T. W. Th. 11 . . 4
Thermodynamics—Engineering 5*b*. M. F. S. 10 . . . 3
Mechanical Laboratory—Engineering 8*b*. W. Th. F. 1.30 to 4 3
Applications of Electricity—Engineering 10*a*. T. W. Th. 8. F. 11 4
Chemical Laboratory—Chemistry 4. M. T. 1.30 to 4 . . 2
One original declamation—English 4.

THIRD TERM.

Heat Motors—Engineering 6. W. Th. F. 9 3
Mechanical Laboratory—Engineering 8*c*. M. T. 9 to 11.45 . 2
Thesis. M. T. W. 1.30 to 4 3

Applications of Electricity—Engineering 10*b*. W. Th. F. 11 . 3
Political Economy—Political Science 1. T. W. Th. F. S. 8 . 5
One original declamation—English 4.

COURSE IN ELECTRICAL ENGINEERING.

Senior Year.

FIRST TERM.

Exercises per week.

Materials of Construction—Engineering 4. M. W. F. S. 11 4
Thermodynamics—Engineering 5*a*. M. 10. T. Th. 11 . 3
Mechanical Drawing—Drawing 4*b*. F. S. 8 to 11 . . . 2
Mechanical Laboratory—Engineering 8*a*. Th. F. 1.30 to 4 2
Dynamos and Electro-Motors—Engineering 7. T. W. Th. 8 3
Chemical Laboratory—Chemistry 4. M. W. 1.30 to 4 . . 2
One original declamation—English 4.

SECOND TERM.

Applications of Electricity—Engineering 10*a*. T. W. Th. 8. F. 11 4
Thermodynamics—Engineering 5*b*. M. F. S. 10 . . . 3
Mechanical Laboratory—Engineering 8*b*. W. Th. F. 1.30 to 4 3
Theoretical Electricity—Physics 8*a*. M. T. W. Th. 11 . . 4
Chemical Laboratory—Chemistry 4. M. T. 1.30 to 4 . . 2
One original declamation—English 4.

THIRD TERM.

Heat Motors—Engineering 6. W. Th. F. 9 3
Applications of Electricity—Engineering 10*b*. W. Th. F. 11 3
Theoretical Electricity—Physics 8*b*. W. F. 10 . . . 2
Thesis. W. 1.30 to 4. Th. F. 1.30 to 3 3
Political Economy—Political Science 1. T. W. Th. F. S. 8 . 5
One original declamation—English 4.

COURSE IN TECHNICAL CHEMISTRY.

Sophomore Year.

FIRST TERM.

Exercises per week.

Analytic Geometry—Mathematics 4. T. W. Th. F. S. 8 . 5
Descriptive Geometry—Drawing 3*a*. M. W. 1.30 to 4 . . 2
German—German 1. T. Th. S. 11 3

Inorganic Chemistry—Chemistry 1. M. W. F. 10 . . . 3
Heat and Light—Physics 2 . { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 } 3
Military Tactics—Military Science 2. Th. 9 or 10.
One Theme—English 2.

SECOND TERM.

Differential Calculus—Mathematics 5*a*. T. W. Th. F. S. 8 . 5
Descriptive Geometry—Drawing 3*b*. M. W. 1.30 to 4 . . 2
German—German 2. T. Th. S. 11 3
Inorganic Chemistry—Chemistry 2. M. W. F. 10 . . . 3
Sound and Electricity—Physics 3 and 4 { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 } 3
Military Tactics—Military Science 2. Th. 9 or 10.
One Theme—English 2.

THIRD TERM.

Integral Calculus—Mathematics 5*b*. T. W. Th. F. S. 8 . 5
Mineralogy—Geology 2. M. W. F. 9 to 11 3
German—German 3. T. Th. S. 11 3
Organic Chemistry—Chemistry 3. W. F. 11 2
Electricity and Magnetism—Physics 4 { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 } 3
Military Tactics—Military Science 2. M. 11.
One Theme—English 2.

Junior Year.

FIRST TERM.

Chemistry of Plant Growth—Chemistry 5*a*. T. W. F. 8 . 3
Shop Work—Shop Work 2*a*. W. Th. 9 to 11 2
German—German 4. M. W. F. 11 3
Chemical Laboratory—Chemistry 4 and 7. Th. F. 1.30 to 4. M. F. 9 to 11. S. 9 to 11.45. M. T. W. 1.30 to 4 . . . 8
Military Tactics—Military Science 2. Th. 8.
One original declamation—English 3.

SECOND TERM.

Chemical Laboratory—Chemistry 7. M. T. W. Th. F. 1.30 to 4. M. 9 to 11 6
Applied Chemistry—Chemistry 6*a*. T. W. 10 2
Mechanics of Engineering—Engineering 3*a*. T. W. Th. F. S. 9 5
German—German 5. M. W. F. 11 3
Military Tactics—Military Science 2. S. 8.
One original declamation—English 3.

THIRD TERM.

Chemical Laboratory—Chemistry 7. M. T. W. Th. F. 1.30 to 4. S. 9 to 11 6
Applied Chemistry—Chemistry 6*b*. M. W. 8 2
Mechanics of Engineering—Engineering 3*c*. T. W. Th. F. S. 8 5
German—German 6. M. W. F. 11 3
Military Tactics—Military Science 2. S. 11.
One original declamation—English 3.

SENIOR YEAR.

FIRST TERM.

Chemical Laboratory—Chemistry 7. M. W. F. 1.30 to 4. T. Th. 9 to 11. W. 9 to 11.50. F. 8 to 11.50 7
Organic Chemistry—Chemistry 8. T. Th. 1.30 to 4 . . 2
Chemical Journals—Chemistry 9. S. 11 1
Thermodynamics—Engineering 5*a*. M. 10. T. Th. 11 . 3
Dynamos and Electro-Motors—Engineering 7. T. W. Th. 8 3
One original declamation—English 4.

SECOND TERM.

Chemical Laboratory—Chemistry 7 and Thesis. Th. F. 1.30 to 4. T. Th. F. S. 8 to 10. W. 8 to 11.50 7
Thermodynamics—Engineering 5*b*. M. F. S. 10 . . . 3
Chemical Journals—Chemistry 9. S. 11 1
Chemical Philosophy—Chemistry 10*a*. T. Th. 10 . . . 2
Electrical Measurements—Physics 9. M. T. W. 1.30 to 4 . 3
One original declamation—English 4.

THIRD TERM.

Chemical Laboratory—Chemistry 7 and Thesis. M. T. W. Th. F. 1.30 to 4 5
Chemical Journals—Chemistry 9. S. 11 1
Chemical Philosophy—Chemistry 10*b*. T. Th. 11 . . . 2
Political Economy—Political Science 1. T. W. Th. F. S. 8 . 5
Meteorology—Meteorology 1. T. Th. S. 10 3
One original declamation—English 4.

GENERAL COURSE.

This course gives to students an opportunity to take parts of the courses in Agriculture and the Mechanic Arts: to pursue the study of English, French, German, and History each

for two or more years: to devote to Philosophy one year and to Mathematics and the Sciences the time usually allowed in colleges. With its arrangement of elective studies it is fitted to serve at the same time as a course for women and as a preparation for professional study or business life.

Sophomore Year.

FIRST TERM.

Introductory Zoölogy—Zoölogy 1. M. W. F. 1.30 to 4 . .	3
German—German 1. T. Th. S. 11	3
Inorganic Chemistry—Chemistry 1. M. W. F. 10 . . .	3
Heat and Light—Physics 2 . . { Div. 1. T. Th. S. 10 / Div. II. T. Th. S. 9 }	3
Medieval and Modern History—History 1. W. F. 11. T. Th. 1.30 to 4. or, Analytic Geometry—Mathematics 4. T. W. Th. F. S. 8	4 or 5
Military Tactics—Military Science 2. Th. 9 or 10.	
One Theme—English 2.	

SECOND TERM.

German—German 2. T. Th. S. 11	3
Inorganic Chemistry—Chemistry 2. M. W. F. 10 . . .	3
Sound and Electricity—Physics 3 and 4 { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 }	3
*Modern History—History 2. M. T. Th. 1.30 to 4 . . .	3
*Animal Biology—Zoölogy 2. W. F. 1.30 to 4 . . .	2
*Advanced Freehand Drawing—Drawing 2*a*. W. F. 8 to 10	2
*Study of Words—English 11. W. F. 11	2
*Differential Calculus—Mathematics 5*a*. T. W. Th. F. S. 8	5
Military Tactics—Military Science 2. Th. 9 or 10.	
One Theme—English 2.	

* Elect 7 hours.

THIRD TERM.

German—German 3. T. Th. S. 11	3
Electricity and Magnetism—Physics 4 { Div. I. T. Th. S. 10 / Div. II. T. Th. S. 9 }	3
*European History since 1789—History 3. T. Th. F. 1.30 to 4	3
*Entomology—Zoölogy 3. M. W. F. 9 to 11	3
*Organic Chemistry—Chemistry 3. W. F. 11	2
*Advanced Freehand Drawing—Drawing 2*b*. M. W. F. 9 to 11	3
*Advanced Rhetoric—English 12. Th. F. 1.30 to 4 . .	2
*Integral Calculus—Mathematics 5*b*. T. W. Th. F. S. 8 .	5
Military Tactics—Military Science 2. M. 11.	
One Theme—English 2.	

* Elect 10 hours.

Junior Year.

FIRST TERM.

German—German 4. M. W. F. 11 3
American Political History—History 4. T. Th. S 10 to 11.50
F. 1.30 to 4 4
Early English—English 5. M. W. F. 10 3
Military Tactics—Military Science 2. W. 8 or Th. 8.
One original declamation—English 3.
*Chemistry of Plant Growth—Chemistry 5*a*. T. W. F. 8 . 3
*Economic Ornithology—Zoölogy 4. S. 8 1
*Chemical Laboratory—Chemistry 4. M. T. W. 1.30 to 4 . 3
*Physical Laboratory—Physics 4. M. T. W. 1.30 to 4 . . 3
*Drawing—Drawing 5 a. T. Th. 8 to 10. Th. 1.30 to 4 . 3

* Elect 6 hours.

SECOND TERM.

German—German 5. M. W. F. 11 3
American Political History—History 5. T. Th. S. 9 to 11 . 3
Elizabethan Writers—English 6. W. F. 9 2
Military Tactics—Military Science 2. S. 8.
Logic—Philosophy 1. M. W. F. 10 3
One original declamation—English 3.
*Geology—Geology 1. T. Th. S. 11 3
*Food and Nutrition—Chemistry 5*b*. W. F. 8 . . . 2
*Chemical Laboratory—Chemistry 4. M. T. W. 1.30 to 4 . 3
*Physical Laboratory—Physics 5. M. T. W. 1.30 to 4 . . 3
*Drawing—Drawing 5*b*. T. Th. S. 8. Th. F. 1.30 to 4 . 2 or 5

* Elect 5 hours.

THIRD TERM.

German—German 3. M. W. F. 11 3
Mineralogy—Geology 2. M. W. F. 9 to 11 3
Writers of Restoration—English 7. T. Th. 11 . . . 2
Political Economy—Political Science 1. T. W. Th. F. S. 8 . 5
Military Tactics—Military Science 2. S. 11.
One original declamation—English 3.
*Drawing—Drawing 5 c. T. Th. S. 9 to 11 3
*Chemical Laboratory—Chemistry 5. M. T. W. 1.30 to 4 . 3
*Physical Laboratory—Physics 6. M. T. W. 1.30 to 4 . . 3

* Elect 3 hours.

Senior Year.

FIRST TERM.

English 4 required; sixteen exercises elective.

One original declamation—English 4.		
Constitutional Law—Political Science 3 Laws of Business—Political Science 2	T. W. Th. F. S. 9	5
German—German 7 or French—French 4	M. W. F. 10	3
Victorian Writers—English 8.	T. Th. S. 10	3
Psychology—Philosophy 2.	T. Th. S. 11	3
Thesis Work		2
Chemical Laboratory—Chemistry 7.	M. T. W. 1.30 to 4	3
Advanced Zoölogy—Zoölogy 6.	M. T. W. Th. 1.30 to 4	4
Advanced Botany—Botany 3.	M. T. W. 1.30 to 4	3
Advanced Zoölogy—Zoölogy 6.	M. T. W. Th. 1.30 to 4	4
1.30 to 4		3

SECOND TERM.

English 4 required; sixteen exercises elective.

One original declamation—English 4.		
German—German 8 or French—French 5	M. W. F. 10	3
Astronomy—Mathematics 6.	T. W. Th. F. 9	4
International Law—Political Science 6.	M. W. F. 11	3
Thesis Work		1 or 2
English Romance—English 9.	Th. F. 3	2
Elements of Philosophy—Philosophy 4.	T. W. Th. F. S. 9	5
Ethics—Philosophy 3.	T. Th. S. 10	3
Advanced Political Economy—Political Science 4.	T. Th. S. 11	3
Chemical Laboratory—Chemistry 7.	M. T. W. 1.30 to 4	3
Advanced Zoölogy—Zoölogy 6.	M. T. W. 1.30 to 4	3
Advanced Botany—Botany 3.	M. T. W. 1.30 to 4	3
Advanced Drawing and Painting—Drawing 6*b*.	M. T. W. 1.30 to 4	3

THIRD TERM.

English 4 required; fourteen exercises elective.

One original declamation—English 4.		
American Literature—English 10.	T. W. Th. F. 9	4
German—German 9 or French—French 6	M. W. F. 10	3
Meteorology—Meteorology 1.	T. Th. S. 10	3

Roads—Engineering 11. M. W. F. 10 3
History of Philosophy—Philosophy 5. M. W. F. 11. S. 9 . 4
Advanced Political Economy—Political Science 5. T. Th. S. 11 3
Chemical Laboratory—Chemistry 7. M. W. F. P. M. . . 3
Advanced Zoölogy—Zoölogy 6. M. W. F. P. M. . . . 3
Advanced Botany—Botany 3. M. W. F. P. M. 3
Advanced Drawing and Painting—Drawing 6c. M. W. F. P. M. 3

THE PREPARATORY YEAR.

The preparatory year, first offered in 1897, is intended to meet a demand which has been made in certain sections of the state where students have with difficulty secured adequate preparation for admission to the Freshman class. It also makes the four years' course of additional value by increasing the requirements for admission to that class.

COURSE OF STUDY AND SCHEDULE OF HOURS.

FIRST TERM.

Exercises per week.

Higher Algebra. M. W. F. 3 3
Plane Geometry. T. Th. 3. W. F. 9 4
Rhetoric, with Study of Authors. M. W. F. 11 . . . 3

For description of work, see Requirements for Admission, page 16.

French Grammar. T. Th. S. 9 3

A drill in the essentials for accurate translation.

Grecian History. T. Th. S. 11 3

SECOND TERM.

Higher Algebra. M. W. F. 3 3
Plane Geometry. T. W. Th. F. 8 4
Rhetoric, with Study of Authors. T. Th. S. 11 . . . 3
French Reader. T. Th. S. 9 3

Easy selections; irregular verbs.

Roman History. M. W. F. 11 3

THIRD TERM.

Study of Authors. W. F. 8 2
Readings from French History. T. Th. S. 9 3

Study of variety of style and peculiarities of syntax.

Elementary Physics. M. T. W. Th. F. S. 11 6
Introductory Botany. M. T. W. Th. F. 1.30 to 4 . . . 5

A general introduction to the study of plants by means of laboratory work and lectures.

THE TWO YEARS' COURSE IN AGRICULTURE.

The Two Years' Course in Practical and Theoretical Agriculture provided for by the Legislature of 1895 was established for and is open to "students who can pass a fair and reasonable examination in reading, spelling, writing, arithmetic, English grammar, and the geography and history of the United States." This course is especially devoted to the study of practical and theoretical agriculture in its various branches, and the natural sciences, which are so closely related to successful farming. At least ten hours each week are spent in practical exercises, which, so far as possible, are educational in their nature. This work is done on the farm, or in the garden, barn, greenhouse, or shop.

The course offers unusual opportunities to young men to obtain in a short time and at small expense a knowledge of the fundamental principles of agriculture.

COURSE OF STUDY AND SCHEDULE OF HOURS.

FIRST TERM.

Elements of Agriculture—Agriculture 1 4
Principles of Plant Growth—Horticulture 1 4
Algebra. T. Th. S. 9 3
Grammar—English Grammar and Composition. W. F. 9 . 2
Drawing. M. T. 1.30 to 4 2

SECOND TERM.

Dairying—Agriculture 2. By appointment. 4
Breeds and Breeding—Agriculture 3 4
Algebra. T. Th. S. 9 3
Grammar. W. F. 9 3
Drawing. M. T. 1.30 to 4 2

THIRD TERM.

Botany. M. T. W. Th. F. 1.30 to 4	5
Chemistry. By appointment.	3
Physics. M. T. W. Th. F. S. 11	5
Algebra. T. Th. S. 9	2
Geography. T. Th. 10 to 12	2

SECOND YEAR.

FIRST TERM.

Soil Physics—Agriculture 4. T. F. 11. Th. 1.30	4
Olericulture—Horticulture 3. M. W. S. 11	3
Introductory Zoölogy—Zoölogy 1. M. W. F. 1.30 to 4	3
English—English. Th. F. 9	2
Geometry—Mathematics. M. W. F. 9	3

SECOND TERM.

Stock Feeding—Agriculture 5. T. F. 11. Th. 1.30	4
Winter Gardening—Horticulture 5. M. W. 11	2
Arboriculture and Forestry—Horticulture 4. T. Th. 10	2
Comparative Anatomy—Zöology 5. S. 8.	1
Animal Biology—Zoölogy 2. W. F. 1.30 to 4	2
English—English. T. Th. 9	2
Geometry—Mathematics. M. W. F. 9	3

THIRD TERM.

Farm Equipment—Agriculture 6. T. F. 11. Th. 1.30	3
Fruit Growing—Horticulture. M. T. W. Th. S. 10	5
Entomology—Zoölogy 3. M. W. F. 1.30 to 4	3
English—English. T. Th. 9	2
Commercial Fertilizers—Chemistry. W. S. 11. F. 10	3

TEN WEEKS' WINTER COURSE IN AGRICULTURE.

The college offers a Winter Course in agriculture, beginning Thursday, January 12, and continuing until Wednesday, March 22, 1899.

No entrance examination is required, but students taking the course should possess a common school education.

The studies offered are dairying, stock-feeding, winter gardening, wood-working, forestry, and entomology, with practice in the creamery, barn, greenhouse, or wood-shop.

A fee of five dollars will be charged for tuition.

The expense of the course may be estimated as follows:

Room and board, ten weeks, at $4	$40.00
Tuition fee	5.00
Books	5.00
Total	$50.00

Applicants should report at the president's office, Thompson Hall, Durham, on Wednesday, January 12, 1898.

TEN WEEKS' COURSE IN DAIRYING.

This course is offered in connection with the Winter Course in Agriculture, to young men who wish to make a specialty of dairying. It is designed for those who are specially desirous of mastering the art of butter-making, or who wish to become fitted for the position of manager or superintendent of a creamery. In New Hampshire, where dairying is carried on to a great extent in the sale of milk for the city markets, thus course is especially valuable as a training for those operating farm dairies.

The course in dairying begins January 12, 1899, and closes March 22. The subjects taught are butter-making, milk testing, pasteurizing milk and cream, dairy bacteriology, dairy farming, dairy chemistry, and care of steam engines and boilers.

The creamery is equipped with separator, milk tester, pasteurizer, and all tools required in making butter and preparing milk and cream for market.

Requirements for admission are the same as for the Winter Course in Agriculture.

ESTIMATE OF EXPENSES.

Room rent, ten weeks at $1	$10.00
Board, ten weeks at $3	30.00
Fee	5.00
Books	3.00
Total	$48.00

For circulars or further information concerning the course, address President Charles S. Murkland, or Prof. C. M. Weed, Secretary, Durham, N. H.

NON-RESIDENT COURSE IN AGRICULTURE.

The Non-resident Course in Agriculture conducted by the New Hampshire College of Agriculture and the Mechanic Arts was established in January, 1894, and has been in successful operation ever since. The course is primarily designed to meet the needs of those farmers' sons who are unable to leave home to attend college, but who feel the need of the fuller knowledge of their work which the college offers.

The course is conducted as a correspondence course, books being sent the student, who studies them and returns answers to examination questions. A circular giving full information concerning this course will be sent upon application.

GENERAL INFORMATION.

ATTENDANCE.

All regular students are required to attend chapel and rhetorical exercises, and to register for at least sixteen exercises per week; all male students are required to attend military drill.

TERM BILLS.

Tuition and fees are payable in advance, in two equal instalments: One on the first day of the fall term, and one on the first day of the winter term, of each year.

ELECTION OF STUDIES.

Every student must, on the Saturday before the last in each term, notify in writing the secretary of the faculty of his elections for the term following. Any student who, having made his elections, desires to change, shall make application to the faculty in writing, with a statement in full of his reasons.

CONDITIONAL ADMISSION.

Students admitted conditionally to the preparatory year must make up all conditions before admission to the Freshman class. Students admitted conditionally to the Freshman class must make up all conditions before admission to the Sophomore class.

CLASSIFICATION OF STUDENTS.

Students are not catalogued in a class until they have completed three fourths of the work in each of the previous years.

DEGREES.

The degree of Bachelor of Science will be conferred upon those who complete a four-years course or its equivalent.

The regular work of the Senior class, including the regular final examinations, is completed at 4 P. M. on the Tuesday of the week preceding Commencement; and each member of the class may receive a statement of his standing at the office of the secretary of the faculty at 2 P. M. on the next day, Wednesday. All work required for graduation must be completed by 6 P. M. of the Saturday of the same week.

Each candidate for a degree must prepare a thesis on some subject relating to the studies he has taken.

After the satisfactory completion of an appropriate amount of post-graduate work, advanced degrees will be given.

POST-GRADUATE STUDY.

The college offers opportunities for post-graduate study in agriculture, biology, chemistry, and engineering.

SPECIAL STUDENTS.

Any person of mature years may be admitted as a special student, by vote of the faculty, upon presenting satisfactory evidence of ability to complete the desired course of study.

PARTIAL COURSE STUDENTS.

A student taking less than the regular work, or having a deficiency that has continued for more than one year, is considered a partial course student.

COURSES FOR WOMEN.

Women attending the college may elect any course laid down in the curriculum, subject to the conditions prescribed for all students. They may omit manual labor on the farm and in the shop, and substitute other studies.

The General Course, with its electives, is specially prepared for women, and is so planned that special courses may be arranged in literature, languages, history, philosophy, drawing, and manual training.

The courses in agriculture and chemistry afford opportunities for the study of the natural sciences, and the engineering courses offer exceptional advantages in mathematics and physics.

PRIZES.

I. The Smyth Prizes.—Hon. Frederick Smyth, of Manchester, N. H., offers to the members of the Senior and Junior classes two prizes, one of twenty dollars and the other of ten, for the best essays on subjects connected with agriculture or the mechanic arts; also three prizes, one of twenty, one of fifteen, and one of ten dollars, for excellence in oratory, open to the upper classes; also two prizes for reading, one of fifteen and one of ten dollars, open to the lower classes.

II. Bailey Prize.—Dr. C. H. Bailey, of Gardner, Mass., and E. A. Bailey, B. S., of Keene, N. H., offer a prize of ten dollars for proficiency in chemistry.

III. Erskine Mason Memorial Prize.—Mrs. Erskine Mason, of Stamford, Conn., has invested one hundred dollars as a memorial of her son, a member of the class of '93, the income of which is to be given, for the present, to that member of the Senior class who has made the greatest improvement during his course.

IV. Entrance Examination Prize of $500. See Valentine Smith Scholarships, page 64.

BUILDINGS.

THOMPSON HALL.

Thompson Hall, the main college building, has a length of 128 feet, exclusive of the porte cochère, which is 40 feet long, and a width of 93 feet in the widest part. It is built of granite and brick, and has three stories besides the basement.

One half of the first floor and basement is devoted to the library, which is provided with a large, well-lighted reading room for papers and magazines, a reference room for special work, a librarian's room, a delivery room, and shelf space for fifty thousand volumes.

The remainder of the first floor is used for offices, recitation rooms, and a waiting room for women.

On the second floor are more offices and recitation rooms, and the botanical and zoölogical laboratories and the museum.

On the third floor is the large hall used as an auditorium, two literary society rooms, and the bell-boy's room.

The building is lighted by gas and electricity, and provided with the most approved system of heating and ventilation.

CONANT HALL.

[Chemical and Physical Laboratories.]

Conant Hall contains the laboratories and lecture rooms for instruction in chemistry, physics, and electrical engineering. It is a substantial brick building, 92 by 70 feet, and three stories high, including the basement. It is heated by steam brought from the shops, lighted by gas and electricity, and provided with a system of thorough ventilation. Water, gas, high pressure steam, hydrogen, oxygen, vacuum, and blast are supplied through pipes whenever needed, and the lecture rooms in addition have switches controlling both dynamo and battery currents, and arrangements for stereopticon illustration.

The basement contains a small workshop, the battery, photometer, photographic and comparator rooms, a clock room protected by double walls against changes in temperature, an acid room, and a water and gas laboratory, provided with the necessary fixtures and appliances.

The first floor, with the exception of one room, is occupied by the physics department. It contains the mineralogical laboratory, which is provided with tile-covered desks and other facilities for blowpipe analysis; the junior physical laboratory; an apparatus room; a reading room and reference room for physical and electrical books and periodicals; an electrical laboratory, from the neighborhood of which masses of iron have been excluded, so that magnetic measurements can be made with a good degree of accuracy; and the physical lecture room, which is provided with all necessary conveniences,

as before mentioned. For optical experiments, the room can be darkened by means of special window-shutters, operated from one of the lecture desks. A stone pier between the two desks makes it possible to use delicate instruments.

The second floor is given up entirely to the chemical department. It contains storerooms, an organic laboratory, a qualitative laboratory, a private laboratory, a dark room for polariscopic and spectroscopic work, a lecture room provided with facilities as before described, a quantitative laboratory, and a room to contain the delicate chemical balances and most important reference works.

The laboratories are fitted up with the most modern accessories, and with special reference to the kind of work to be performed in each.

THE SHOP BUILDINGS.

The shops have been planned and built with the object of providing facilities for instruction in the working of wood and metals, and in the design, construction, care, and management of machinery. Incorporated with the shops is a central station for furnishing heat, light, water, and power, wherever needed in any of the college buildings; and the machinery of this station forms a part of the material equipment of the engineering departments.

The main shop building is 42 by 106 feet, and two stories high, with a basement 31 by 42 feet. In a separate one-story building, 40 by 100 feet, on a level with the basement of the main building, are the boiler house, forge shop, coal shed, and foundry.

In the boiler room, three boilers, aggregating one hundred and sixty horse-power, furnish steam to all the college buildings, wherever needed for heating or power. A brick chimney 95 feet high carries away the waste gases from the furnaces. The coal room provides for the storage of two hundred tons of coal conveniently near the boilers.

The basement of the main shop building is used as an engine-room, containing a forty horse-power engine, furnishing power for the shops and for the electric lighting; a dy-

namo for lighting the college buildings and campus; and the large steam pump, which receives water by gravity from the reservoir one half mile distant, and forces it through underground mains to the various hydrants and buildings. The engine-room serves as a power laboratory, and the machines mentioned, with others, will give to students opportunity for making efficiency tests.

On the first floor of the main shop building, a lavatory is provided. The largest room on this floor is the machine-shop, where there is opportunity for practice in the operations of working metals by cutting tools, both by hand work and by machinery.

The second floor of this building is mainly occupied by a wood shop, in which the common branches of carpentry, joinery, and pattern making are taught. Practice is given in the use of carpenter's tools, and in the care and operation of the machines of most general use in wood-working.

The shop buildings are constructed on the "slow-burning" principle, with thick walls, and heavy, continuous plank floors. The rooms are all well lighted and well ventilated.

APPARATUS.

The various chemical laboratories are supplied with a full line of such apparatus as is required in each. Besides all necessary glass and porcelain ware, this includes water baths; drying ovens, combustion, muffle, and assay furnaces; platinum dishes and crucibles; polariscope; spectroscope; balances; lantern and other lecture appliances, etc.

The physical laboratory is equipped with a good collection of the usual apparatus for laboratory work and lecture-room illustration, to which will be continually added pieces purchased or made in the college shop.

In electricity and magnetism, the equipment includes instruments of high precision, and of the latest forms, for the measurement of current electro-motive force and resistance, as well as others of less accuracy for elementary work.

For more strictly electrical engineering work, the depart-

ment has the five-hundred-light alternator used in lighting the college buildings, a direct-current "exciter" dynamo, all the apparatus of a complete fifty-five-light Edison isolated electric lighting plant, a Sorley storage battery of twenty-six cells, arc and incandescent lamps, and standard forms of voltmeter, ammeter, and transformer.

The zoölogical laboratory is well supplied with aquaria, microscopes, dissecting tools, charts, reference books, collections, etc.

The botanical laboratory is supplied with a good herbarium, microscopes, and the other necesssary appliances.

The surveying instruments are sufficient in number and of the most approved pattern.

MUSEUM.

The museum had for a nucleus the collections made during the state geological survey. To this additions have been made from various sources. Many specimens are being collected to illustrate zoölogy—especially entomology. It occupies a large, well-lighted room in the main building.

LIBRARY.

The library of the college consists of about six thousand bound volumes, besides pamphlets. A considerable part of these are new and expensive books, making good working libraries for the different departments of instruction, including economic science and English and American literature.

Students also have the free use of the Durham public library of about five thousand well-selected volumes.

The college supports a reading-room, which is well supplied with the leading American and foreign periodicals.

FARM.

The farm contains more than three hundred acres of valuable land. It has been provided partly from the funds given by Hon. John Conant, and partly from the Benjamin Thompson estate.

It is used for the purpose of an experiment station, for which it is considered by leading agriculturists to be especially fitted.

A model barn has been erected, at an expense of about ten thousand dollars.

SITUATION AND RAILROAD CONNECTIONS.

Durham is situated on the western division of the Boston & Maine railroad, sixty-two miles from Boston, and about midway between Rockingham Junction and the city of Dover, being five miles from the latter place.

PECUNIARY AID AND EXPENSES.

Tuition is $60 per year, although numerous scholarships give free tuition to many New Hampshire students.

CONANT SCHOLARSHIPS.

There are thirty Conant scholarships, each paying $40 and tuition, $60,—total $100. These are to be assigned under the following conditions:

1. They are to be given to young men taking an agricultural course.
2. Each town in Cheshire county is entitled to one scholarship, and Jaffrey is entitled to two.
3. Scholarships not taken by students from Cheshire county, and those in excess of the number of towns, are to be assigned to agricultural students at the discretion of the Faculty.

SENATORIAL SCHOLARSHIPS.

There are twenty-four senatorial scholarships,—one for each senatorial district. Each scholarship is to pay tuition, $60. Senatorial scholarships not filled can be assigned to students from other localities at the discretion of the Faculty; they are open to students in all courses.

Early application should be made for these scholarships. They will be reserved for those respective towns and districts until August 1 of each year, after which they may be otherwise assigned for the year.

These scholarships are given for the purpose of aiding deserving students, and will be withdrawn from those who use tobacco or intoxicating liquors, or show themselves not deserving. Janitorships, work on the farm, etc., also furnish assistance to a considerable extent.

VALENTINE SMITH SCHOLARSHIPS.

Through the generosity of Mr. Hamilton Smith of Durham, the sum of $10,000 has been given to the college to establish the Valentine Smith scholarships.

"The income thus accruing to the college shall be given to the graduate of an approved high school or academy who shall, upon examination, be judged to have the most thorough preparation for admission to the college, provided,

"That this income shall be paid to the student to whom it is awarded, in eight semi-annual payments, at the time appointed for the payment of term bills, and,

"That if the student receiving this scholarship shall at any time prove unworthy, in the judgment of the faculty, by reason of defective scholarship or character, he shall forfeit his claim to the student most deserving; and

"That if the student receiving this scholarship shall cease to be a member of the college, the income from this fund, for the unexpired term, shall be awarded to the student most deserving, in character and scholarship."

These scholarships, yielding $500 each, will be available to those applying for examination, June, 1898, and to one student in each succeeding class.

Expenses may be estimated as follows:

Tuition	Free	$60.00
Text-books	$10.00	20.00
*Fees	15.00	15.00
Room rent, including fuel	18.00 to	40.00
Board, $3 to $3.50 per week, for 35 weeks	105.00 to	122.50
Total	$148.00	$257.50

* Including all charges commonly considered for extras, except those for breakage and damage to college property.

Room rent is estimated on the supposition that two students occupy the same room or suite of rooms.

Rooms may be obtained either furnished or unfurnished. Most of the rooms are in suites, and are in buildings provided with heating apparatus and bath rooms.

The college has no rooms for students.

In Q. T. V. Hall the expense of the best suites, with heating, is $70 per year.

In DeMeritt Hall the expense of board, room rent, in best suites, heating, furniture, and care of rooms is $4.50 per week, for each student.

For further information, address President Charles S. Murkland, or Prof. C. M. Weed, secretary of the Faculty.

AGRICULTURAL EXPERIMENT STATION.

This department of the college is provided for by the national government, at an annual expense of fifteen thousand dollars.

The act of congress provides,—

"That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping, as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective states and territories."

NESMITH HALL.

Nesmith Hall, a brick building two stories in height, is used for the work of the Agricultural Experiment Station. It contains offices and working rooms, a reference library, a chemical laboratory, a bacteriological and microscopical laboratory, and an agricultural museum.

BOARD OF CONTROL.

Hon. FRANK JONES, *Chairman* . .	Portsmouth.
Hon. GEORGE A. WASON . . .	New Boston.
CHARLES W. STONE, A. M., *Secretary* .	East Andover.
Hon. JOHN G. TALLANT . . .	Pembroke.
Pres. CHAS. S. MURKLAND, *ex officio* .	Durham.

STATION COUNCIL.

CHARLES S. MURKLAND, A. M., Ph. D., *President and Acting Director.*
FRED W. MORSE, B. S., *Chemist and Vice-Director.*
CHARLES H. PETTEE, A. M., C. E., *Meteorologist.*
HERBERT H. LAMSON, M. D., *Bacteriologist.*
CLARENCE M. WEED, D. Sc., *Entomologist.*
FRANK WILLIAM RANE, B. Ag., M. S., *Horticulturist.*
CHARLES W. BURKETT, M. S., *Agriculturist.*

CLEMENT S. MORRIS, *Clerk.*
WILLIAM F. FISKE, *Assistant Entomologist.*
ELWIN H. FORRISTALL, B. S., *Assistant Agriculturist.*
ARTHUR GIVEN, B. S., *Assistant Chemist.*

PRIZE RECORD FOR 1898.

SMYTH PRIZES.

Given by Hon. Frederick Smyth, of Manchester, N. H.

Essay Writing.

1st. Harry E. Barnard.
2d. Harry P. Richardson.

Speaking:

1st. Herbert F. Moore.
2d. Harrison E. Clement.
3d. Grace A. Mark.

Reading:

1st. Elmer E. Lyon.
2d. Blanche M. Foye.

BAILEY PRIZE.

Given by Dr. C. H. Bailey, of Gardner, Mass., and E. A. Bailey, B. S., of Keene.

Arthur Given.

ERSKINE MASON MEMORIAL PRIZE.

Gerry Austin Morgan.

SENIOR STANDING HIGHEST IN THE MILITARY DEPARTMENT.

Herbert Fisher Moore.

WINNER OF INDIVIDUAL PRIZE DRILL.

Charles Lund Hunt.

ENTRANCE EXAMINATION PAPERS.*

I. ARITHMETIC.

1. Reduce $\frac{12012}{103740}$ to its lowest terms.

2. Divide $\frac{3}{2}$ of $\frac{5}{6}$ by $\frac{\frac{5}{8}}{\frac{4}{6}}$ and subtract the quotient from $\frac{2\frac{1}{2}}{4-\frac{2}{3}}$.

3. Upon what unit is the whole metric system based? How was that unit obtained? What is a gram?

4. What is the weight in grams of one cubic decimeter of pure water under standard conditions?

5. How many hectares in a rectangular piece of land 500 meters long and 25 meters wide?

6. The population of a certain city is 100,000. It has gained 20,000; what has been the gain per cent?

7. Extract the square root of $\frac{6\frac{1}{4}}{2\frac{1}{4}}$ to five decimal places.

8. If 4 men build 19 rods of wall in $2\frac{1}{2}$ days, in how many days will 7 men build 20 rods?

9. A, B, and C formed a partnership and cleared $20,000. A put in $8,000 for 4 months, and then added $2,000 for 6 months; B put in $16,000 for 3 months, and then withdrawing half his capital, continued the remainder for 5 months longer; C put in $13,500 for 7 months. How divide the profits?

10. Find the simple, the annual, and the compound interest on $1,000 for 2 years, 5 months, and 7 days, at 6 per cent.

II. ALGEBRA.

1. Define algebra, formula, radical, term, and factor, and give the signification of fractional and negative exponents.

2. From $3ax^2-(4a-2x)(x+2x)+a[\,y-(a+2y)\,]$ subtract $5a(x-y)+3a^2-2x^2(a+1)$.

* Given as specimens of average papers.

3. Multiply $a^2x^{-\frac{1}{3}}-3x$ by $b+2\bar{x}^{-2}$.

4. Divide $4a^2y^3x^{\frac{2}{3}}$ by $-2a^3b^2yx^2$ and extract the cube root of the quotient.

5. $\frac{3a}{x}+\frac{2}{6y}=5$. $\frac{4a}{x}-\frac{1}{6y}=2$. Solve for x and y.

6. Obtain prime factors of a^3-x^3, a^3+x^3, and a^4-x^4.

7. Multiply $\sqrt{-x}$, $-\sqrt{-y}$, $-\sqrt{y}$ and $\sqrt{y}$.

8. $\frac{1}{a+\sqrt{a^2-x^2}}-\frac{1}{a-\sqrt{a^2-x^2}}=\frac{a}{x^2}$. Solve for x.

9. Reduce $\frac{\sqrt{2}+\sqrt[3]{3}}{\sqrt{2}-\sqrt[3]{3}}$ to a fraction with a rational denominator.

10. $4ay^2-3by=c$. Solve for y.

III. PLANE GEOMETRY.

1. Define geometry, proposition, theorem, problem, axiom, postulate, corollary, scholium, right angle, perpendicular, parallel, magnitude, and form.

2. Define trapezoid, rhombus, regular polygon, apothem, sector of a circle, and segment of a circle. Name and explain the different kinds of triangles.

3. Give expressions for the circumference and area of a circle. State the relations existing between similar areas.

4. Demonstrate that if a perpendicular be erected at the middle of a line, any point in that perpendicular is equally distant from the extremities of the line; also that any point without is nearer the extremity on its own side of the perpendicular.

5. Demonstrate that if two lines are cut by a third, making the sum of the interior angles on the same side of the secant line equal to two right angles, the two lines are parallel.

6. Demonstrate that in the same or equal circles two incommensurable arcs are to each other as the angles which they subtend at the center.

7. Demonstrate that the opposite sides of a parallelogram are equal.

8. Demonstrate that triangles mutually equiangular are similar.

9. Construct a fourth proportional to three lines.

IV. PHYSICS.

1. Define motion, velocity, acceleration, mass, force, energy, work, heat, temperature, a ray of light, a mirror, a lens, magnetic substances, a conductor.

2. There are two equal forces of 10 units each acting upon the same body, and their lines of action are at right angles to each other. Find the resultant of the two forces.

3. A lever 10 feet long is supported on a fulcrum 4 feet from one end. At the shorter end is placed a weight of 150 pounds. What weight placed 1 foot from the other end of the lever will keep it horizontal?

4. Name and illustrate some of the effects of heat. What is the object of the thermometer? At what temperature Fahrenheit does water freeze? boil?

5. A beam of light strikes a pane of glass at an angle of 45 degrees. What angle will it make with the pane on passing into the air again? Give the reasons for the answer.

6. Explain what is meant by an echo.

7. Name some of the applications of electricity.

V. BOTANY.

1. Define germination, cotyledon, plumule, caulicle.

2. What is the purpose of the root? Name the different kinds of roots.

3. What is the purpose of the stem? Define rhizome, tuber, bulb.

4. What is an annual plant, a biennial, a perennial, an herb, a shrub, a tree?

5. Name the parts of a leaf. Name six different forms of leaf.

6. What is a compound leaf? Define stipule, bract, involucre.

7. Define raceme, head, spike, umbel, panicle, cyme.

8. Define calyx, sepal, petal, corolla, perianth, pollen, ovule.

9. What are the different parts of a stamen, of a pistil? What is a perfect flower, a complete flower? Define monecious, diecious.

10. What is a fruit, a multiple fruit, stone fruit, pod, capsule, follicle?

VI. PHYSICAL GEOGRAPHY.

1. Name the principal mountain chains of North America and South America. Give the situation of each.

2. Classify volcanoes. Locate and give an account of some of the principal ones.

3. Describe the Arctic current; the Japan current; and the equatorial currents of the Atlantic and the Pacific.

4. What are isothermal lines? If the earth were divided by isothermal lines into six zones, what would be included in each zone?

5. Draw a map of the United States and place upon it the isothermal lines which would pass through Central New Hampshire.

6. Give a comprehensive account of the St. Lawrence basin.

VII. HISTORY OF THE UNITED STATES.

1. Give a brief account of the Spanish exploration of North America.

2. What nations held territory in North America during the seventeenth century? What did each nation hold?

3. Give an account of King Philip's War.

4. Give an outline of the French and Indian War.

5. Give a brief but comprehensive account of the Siege of Yorktown (1781).

6. Give a brief account of the adoption of the Constitution.

7. Give the causes and results of the Mexican War.

8. Give a brief account of each acquisition of United States territory.

9. Give an account of the principal military operations during the year 1864.

10. Explain the Emancipation Proclamation and the Alabama claims.

VIII. GRECIAN HISTORY.

1. Give an account of the war between Sybaris and Croton.

2. Describe the different orders of Grecian architecture and explain the technical terms.

3. Compare the laws of Lycurgus with those of Solon.

4. Give an account of the siege of Plataea.

5. Give an account of the life and teachings of Socrates.

6. Give a description of the Parthenon.

7. Give some account of the Stoics and the Epicureans.

8. With fifty words for each, give an account of Croesus and Histiaeus.

9. Locate and, with a sentence for each, describe the following: Corcyra, Olympia, Egina, Delphi, Thebes.

10. Draw a map showing the location of the places mentioned in the above questions.

IX. ROMAN HISTORY.

1. Give an account of the classes of people found in Rome.

2. Give the history of the Laws of the Twelve Tables.

3. Give a history of the war with Pyrrhus.

4. Give an outline of the conquest of Gaul.

5. Give an account of the expedition of Crassus against the Parthians.

6-8. Give an account of each of the following, using about fifty words in each case: Sulla, Mark Antony, Caligula, Cicero, Vespasian, Titus.

9. Draw a map showing the Roman empire at its greatest extent.

10. Locate and, with a sentence for each, describe the following: Etruria, Numidia, Pannonia, Tarentum, Mauritania, Moesia, Sardinia, Po, Danube, Alps.

X. FRENCH.

1. Give five simple tenses of some regular verb of the first conjugation.
2. Give the principal parts of ten irregular verbs.
3. Give examples of different ways of forming the feminines of adjectives.
4. Count from 1 to 15.
5. The translation of a page of easy French.

XI. ENGLISH.

The composition should be correct in spelling, grammar, and punctuation.

I.

Select any *four* of the following topics and write a short composition on each:

1. The Minister's Black Veil.
2. The arrival of the Puritans at Merry Mount.
3. Mr. Higginbotham's Catastrophe.
4. A Rill from the Town Pump.
5. The White Old Maid.
6. Endicott and the Red Cross.
7. The Beginning of the Plague in London.
8. The Story of the Piper.
9. Defoe's Account of the Shutting up of Houses.
10. The Burial of those who died of the Plague.
11. My Opinion of the State of London during the Plague.
12. The Adventures of the Old Soldier, the Lame Sailor, and the Joiner.

II.

Omit *one*.

1. Give an account of Samuel Johnson's life until he left Oxford.
2. What were the relations between Johnson and Boswell? What is Macaulay's estimate of the latter?
3. What, according to Macaulay, were, in general, the circumstances of English men of letters at the time of Johnson's first arrival in London?

4. State the circumstances under which Johnson's edition of Shakespeare's plays was produced? What is Macaulay's opinion of the work?

5. What do you think of Johnson as a man?

ALGEBRA FOR PREPARATORY YEAR.

1. Define algebra, coëfficient, formula, term, factor, exponent, and root.

2. From $4ay-(3a+2ay)+(a-y)(a+y)$ take $2y^2-4a+7ay$.

3. Obtain prime factors of a^3-x^3 ; a^3+x^3 ; a^4-x^4.

4. Simplify $\dfrac{x-a}{x-\dfrac{(x-b)(x-c)}{x+a}}$

5. $\dfrac{6x+13}{15}-\dfrac{3x+5}{5x-25}=\dfrac{2x}{5}$. Solve for x.

6. Two bicyclists started at the same time from New York and Boston, a distance of 200 miles, traveling one at $9\frac{1}{2}$ miles an hour, the other at $9\frac{1}{4}$ miles an hour. In how many hours after starting did they meet, and how far from Boston ?

7. $ax+by=c$; $px+qy=r$. Solve for x and y.

8. Extract square root of $4x^4+9-30x-20x^3+37x^2$.

9. Cube $a+2b-3c$. Square $x-2y^2+ax$.

ENGLISH FOR PREPARATORY YEAR.

Use great care. Divide into paragraphs. Marked inaccuracy in spelling, grammar, or composition will be considered as a failure.

1. Write a simple sentence containing eight or more words, and tell what part of speech each word is.

2. Write a complex sentence and a compound sentence. Explain the difference between them.

3. Give the third person singular of the verb "lead" in all

the moods and tenses, in both the active and the passive voice.

4-6. Write fifty words upon each of the following:

(1) Changes made by the railroads of New England.

(2) Indian wars of New England.

(3) The New England town-meeting.

7. Correct the errors in the following sentences:

(1) The boy stood on the burning deck,
Whence all but he had fled.

(2) I am going and see him this afternoon.

(3) He hadn't seen what he had ought to do.

(4) Get up on to the platform.

(5) Try and read as many a good book as you can.

(6) I guess he will resign, for he told he was going to.

8. What is the proper difference (if any) in meaning between the two following?

I would do it if I could. I should do it if I could.

9. Which is the right expression,

He felt badly at his loss, or, He felt bad at his loss. If you substitute "discouraged" for "badly" or "bad," in the above, what part of speech will it be?

CATALOGUE OF GRADUATES.

BACHELORS OF SCIENCE.

NOTE.— The arrangement is; (*a*) Name in full. (*b*) Later degrees taken. (*c*) Residence at time of entering college. (*d*) Occupation, etc. (*e*) Present residence. * Dead.

1871.

William Preston Ballard, Concord. Farmer. *Concord.*
Lewis Perkins, Hampton. Railroad Contractor.
North Adams, Mass.
Charles Henry Sanders, Penacook. Merchant. *Penacook.*
3—

1872.

Edwin Bartlett, Bath.
Frank Alexander White, Bow. Farmer and Surveyor.
Bow. P. O. Box 431, Concord, N. H.
2—

1873.

Frederick Erasmus Eldredge, Kensington.
James Fred Smith, A. M. (Dartmouth, 1885), Principal Iowa College Academy. *Grinnell, Iowa.*
Charles Henry Tucker, Plaistow. Woodworker.
24 Highland Street, Amesbury, Mass.
3—

1874.

Millard Fillmore Hardy, Nelson. Graduated Theo. Inst., Ct., 1878. Clergyman. *Townshend, Vt.*
*Henry Abbott Sawyer, North Weare. Business.
2—*1

1875.

Walton Herman Aldrich, M. D. (Univ. N. Y. City, 1880), Troy. Physician. *Marlborough.*
Frank Pierce Curtis, Stoddard. Manager of Store.
Greenfield, Mass.
Frank Veranus Emerson, Lebanon. Manager Emerson Edge Tool Co. *East Lebanon.*

Charles Webster Hardy, M. D. (Mo. Med. Coll., 1881), Marlborough. Physician. *Waterville, Kan.*

Harvey Jewell, Winchester. Butler & Jewell, Nurserymen and Fruit Growers. *Cromwell, Ct.*

*Charles Ormille Leavitt, Lebanon.

*John Loney McGregor, D. D. S. (Phila. Dental Coll., 1877), M. D. (Dartmouth, 1883), Whitefield. Physician.

Eliel Peck, Lebanon. Merchant. *Kimball, Minn.*

Ira William Ramsey, Walpole. Farmer. *Walpole.*

Orlando Leslie Seward, Keene. Architect. *Keene.*

Emery Mason Willard, Harrisville. Druggist, with G. S. Cheney & Co., 15 Union St., Boston, Mass.
109 Hewlett St., Roslindale, Mass.

11—*2

1876.

Herbert Cyril Aldrich, Troy. Insurance and Real Estate. *Keene.*

Edmund Lawson Brigham, Jaffrey. Mechanic. *Clinton, Mass.*

Joseph Warren Butterfield, Westmoreland. Farmer. *North Montpelier, Vt.*

Arthur Frank Chamberlain, Westmoreland. General Salesman for Michigan. Edson, Keith & Co., Chicago.
6542 Kimback Ave., Chicago, Ill.

Anson Ballard Cross, Holyoke, Mass. Railroad Contractor, with Vandegrith & Jacobs, Philadelphia. *Wilmington, Vt.*

Warren Webster Kimball, Troy. E. P. Kimball & Son, General Store. *Troy.*

Daniel Deeth Parker, Fitzwilliam. Manufacturer. *Gardner, Mass.*

7—

1877.

Rollin Kirk Adair, Indian Territory. Farmer. *Locust Grove, Cherokee Nation, Indian Ter.*

*Homer Brooks, M. D. (N. Y. Hom. Med. Coll., 1881), Franconia.

John Washington Carson, Mont Vernon. Farmer. *Francestown.*

*Charles Otto Chubert, Troy.

*Charles Albert Edwards, LL. B. (State Univ., Iowa, 1880), Keene. Lawyer.

William Francis Flint, Richmond. Surveyor, Fruit Grower, and Forestry Expert. *Winchester.*

Clinton Camillus Hall, Westmoreland, Farmer. *East Westmoreland.*

John Goodrich Henry, M. D. (Dartmouth, 1880), Chesterfield. Physician. *Winchendon, Mass.*

Charles Pitkin Hollister, North Montpelier, Vt. Farmer. *North Montpelier, Vt.*

George Mirick Holman, M. D., Fitchburg, Mass. Chemist. *Fitchburg, Mass.*

Charles Appleton Hubbard, Troy. Comptroller of the Oregon Short Line Railroad Company, Boston. *Newton Center, Mass.*

Charles Augustus Wheeler, East Calais, Vt. Farmer and Bee Keeper. *Bracken, Corral Co., Texas.*

Everard Whittimore, Fitzwilliam. Agent, New York Life Insurance Co. *Hudson, Mass.*

13—*3

1878.

Ezra Eastman Adams, Manchester.

*Elmer Kilburn, Marlow. Civil Engineer.

Charles Edward Record, Fitchburg, Mass. Contractor and Builder. *Leominster, Mass.*

3—*1

1879.

Charles Hardy Bailey, M. D. (Dartmouth, 1881). Physician. *39 East Broadway, South Gardner, Mass.*

Richard Clinton Chapin, Chicopee, Mass. Agent for Nonotuck Paper Company. *Holyoke, Mass.*

Lucius M. Cragin, Lempster. Farmer and Surveyor. *Springfield, Vt.*

*Nathaniel Cutter Holmes, Jaffrey. Lawyer.

Fred Charles Parker, Lempster. Merchant. *Acworth.*

George Henry Wilkins, M. D. (N. Y. Hom. Med. Coll., 1883), Amherst. Physician. *Palmer, Mass.*

6—*1

1880.

Charles Harvey Hood, Derry. Milk Contractor. H. P. Hood & Sons, Boston, Mass. *20 Highland Ave., Somerville, Mass.*

1—

1881.

Edwin Thomas Aldrich, Troy. With G. H. Aldrich & Son, General Insurance Agents. *Keene.*

Henry Lyman Barnard, Troy. Clerk. *Troy.*

*George Jordan Boardman, Lawrence, Mass.

Edwin Franklin Bristol, Harwinton, Conn. Farmer and Mill Owner. *Ascutneyville, Vt.*

Artemas Terald Burleigh, Farmer. *Franklin.*

Frank Dana Ely, Cavendish, Vt. Business. *Cavendish, Vt.*

Sanford Eugene Emery, LL. B. (Albany Law School, 1886), Proctorsville, Vt. Lawyer. Postmaster. *Proctorsville, Vt.*

Charles Herbert Hazen, Hartford, Vt. Farmer. *Bethlehem.*

Frank Marston, Hartford, Vt. Merchant. *Olcott, Vt.*

William Augustus Megrath, M. D. (Dartmouth, 1885), Cavendish, Vt. Physician. *London.*

Fred Townsend Stanton, Strafford. Farmer. *Strafford Corner.*

Victor Hugo Stickney, M. D. (Dartmouth, 1883), Tyson, Vt. Physician. President Electric Power & Coal Co. Vice-president First National Bank. *Dickinson, N. Dak.*

Samuel Austin Wallace, Ph. G. (Boston School of Pharmacy, 1886), West Hartford, Vt. Druggist. *Crookston, Minn.*

George Herbert Whitcher, Strafford. Professor of Agriculture and Director of Experiment Station (1887-'94). General Agent Bowker Fertilizer Co., Boston. *Durham.*

14—*1

1882.

Harvey Lincoln Boutwell, LL. B. (Boston Univ., 1886), Hopkinton. Lawyer, 209 Washington St., Boston. *37 Peirce St., Malden, Mass.*

Dana Justin Bugbee, North Pomfret, Vt. Agent for Publishers. *North Pomfret, Vt.*

Robert Fletcher Burleigh, M. D. (Dartmouth, 1887), Franklin. Physician. *Rochester.*

La Forrest John Carpenter, Surry. *Cliff St., Malden, Mass.*

Edwin Preston Dewey, Hanover. Civil Engineer. *Pasadena, Cal.*

George Andrew Loveland, LL. B. (Univ. of N. Y., 1886), Norwich, Vt. Observer and Section Director, U. S. Weather Bureau. *Lincoln, Neb.*

John Wright Mason, Hanover.

Harlan Addison Nichols, Derry. County Physician. *Fort Stockton, Texas.*

*Frank Elmer Thompson, Stark. Vice-president and Treasurer, Blackwater Lumber Co.

9—

1883.

Elmore Ferdinand Arnold, M. D. (Univ. City of N. Y., 1885), Londonderry, Vt. Physician. *New York, N. Y.*

Frank Landor Bigelow, Proctorsville, Vt. Instructor in Mathematics and Sciences, Goddard Seminary, Barre, Vt., 1883-'86. Business. *Rutland, Vt.*

Frederick Stocks Birtwhistle, Troy. Electrical Engineer, Foreign Dept., General Electric Co., 44 Broad St., New York. *Troy.*

Noice D. Bristol, Hawinton, Conn. Scenic Photographer. *176 Euclid Avenue, Cleveland, O.*

Frederick Plummer Comings, Lee. Trustee 1891—. Principal High School, South Yarmouth, Mass. *Lee.*

Frank Harry Follansbee, Canaan. Railway Mail Clerk. *Enfield.*

Adams Clark French, Franklin Falls.

James Edgar Gay, Tunbridge, Vt. Partner, Gay Brothers Cavendish Woolen Mills. *Cavendish, Vt.*

Elmer Daniel Kelley, Franklin Falls. Farmer and Market Gardener. *Franklin Falls.*

Alvah Benjamin Morgan, Canaan.

William Lincoln Whittier, Deerfield. Farmer and Manufacturer of Lumber. *Deerfield Center.*

Charles Minot Woodward, Hanover. Instructor in Agriculture, 1883-'84. Teacher of Science, High School. *Corsicana, Tex.*

12—

1884.

*Ernest Smith Cummings, Lee. U. S. Signal Service.

Fred Carlos Davis, South Reading, Vt. Lawyer. Clerk and attorney, Springfield Electric Railway Co. *Springfield, Vt.*

Sylvester Miller Foster, Riverhead, N. Y. With N. W. Foster & Son, General Insurance Agents. Secretary, Suffolk County Agricultural Society. Secretary and Treasurer, Riverhead Coal Co. *Riverhead, N. Y.*

Herbert Harvey Kimball, Hopkinton. Clerk, U. S. Weather Bureau. *Washington, D. C.*

Moses Bisbee Mann, Benton. Custom House Official. *11 Hancock St., Malden, Mass.*

George Milton Moore, Plymouth, Vt. Insurance Agent. *Ludlow, Vt.*

Ziba Amherst Norris, Lyme. Norris Bros., Groceries and Provisions, 1673-79 Washington St., Boston. *1677 Washington St., Boston, Mass.*

Edwin Chapin Thompson, Lee. Observer in charge U. S. Weather Bureau. *Sandusky, Ohio.*

8—*1

1885.

George Ellsworth Adams, Weston, Vt. Merchant. *Vernal, Utah.*
Ruel Seabury Alden, Lyme. Superintendent of College Farm, 1895-'97. Farmer. *Concord.*
Walter Eugene Angier, C. E. (Dartmouth, 1887), West Swanzey. Civil Engineer.
Edward Alonzo Bailey, West Swanzey. With George Holbrook & Co. *Keene.*
Phillips Greenleaf Bickford, Lyme.
Andrew Walter Brill, Riverhead, L. I. Seedsman and Florist. *Hampstead, Queens Co., N. Y.*
Paul Cuff Brooks, Boston, Mass.
Frank Jay Emerson, Epping. Clerk, Great Falls House. *Somersworth.*
Allen Hazen, Wilder, Vt. Consulting Engineer. *St. Paul Building, 220 Broadway, N. Y.*
George Mayo Mullens, Londonderry. Farmer. *North Londonderry.*
Albert Henry Wood. Lebanon. Associate Professor of Agriculture, 1890-94. Grain merchant. *Framingham, Mass.*

11—

1886.

Frank Albert Davis, M. D., South Lee. *41 West Newton St., Boston, Mass.*
James Ellsworth Harvey, Surry. Photographer. *Clinton, Mass.*
Belezar Stoianoff Ruevsky, Sistova, Bulgaria. Professor in State Commercial School. *Sistova, Bulgaria.*
Madison Templeton Thurber, M. D. (Dartmouth, 1890), Webster. Physician. *95 Savin Hill Avenue, Dorchester, Mass.*
Edward Hills Wason, New Boston. Lawyer. *Nashua.*
George Pillsbury Wood, Lebanon. Civil Engineer. City of Baltimore Topographical Survey. *922 Equitable Building, Baltimore, Md.*

6—

1887.

William Sprague Currier, Norwich, Vt. In charge U. S. Weather Bureau Office. *Toledo, Ohio.*
Arthur Woodbury Hardy, C. E. (Dartmouth, 1889). Hopkinton. Civil Engineer.
George Albert Sanborn, Rochester. County Agent, California Perfume Co. *Rochester.*
Hiram Newton Savage, White River Junction, Vt. Member, Am.

Soc. C. E.; Engineer-in Charge, Sweetwater Dam Irrigation and Domestic Water System; Chief Engineer, San Diego Land and Town Co.; Chief Engineer, National City and Otay Railway Co. *National City, Cal.*

Bion Leland Waldron, Strafford. Weather Bureau. *Louisville, Ky.*

5—

1888.

Melvin Burnside Carr, North Haverhill. With West End Street R. R., General Power Station. *Boston, Mass.*

Herbert Grant Davis, South Lee. Electrical Engineer, Woburn Electric Light Co. *Woburn, Mass.*

Edwin Chandler Gerrish, Webster. Assistant Paymaster for Proprietors of the Locks and Canals on the Merrimack River. *Lowell, Mass.*

William Nelson Hazen, C. E. (Dartmouth, 1890), Hartford, Vt. Designing Engineer, Berlin Iron Bridge Co. *East Berlin, Conn.*

Edward David O'Gara, Hanover. Farmer. *Hanover.*

George Elmer Porter, M. D. (Dartmouth, 1892), Hartford, Vt. Physician. *Marengo, Wayne Co., N. Y.*

George Jonathan Sargent, Canterbury. Civil Engineer. *39 No. Main St., Concord.*

John Warren Smith, Grafton. Observer U. S. Weather Bureau. *Helena, Montana.*

George Elwin Walker, Littleton. Farmer. *Littleton.*

9—

1889.

Fred Harvey Colby, Hopkinton. Fruit Grower. *Prosser, Wash.*

Linwood Carroll Gillis. Editor and Publisher, "Hanover Gazette"; Proprietor, Dartmouth Press. *Hanover.*

*Louis Jerome Hutchinson. Norwich, Vt. Electrician.

John Lawrence Norris, Lyme. Norris Bros., Groceries and Provisions, 1673-79 Washington St., Boston. *6 Worcester Sq., Boston, Mass.*

Charles Walter Earl Scott, Winchester. *Winchester.*

David Elmer Stone, Hartford, Vt. Grain merchant. *South Framingham, Mass.*

Fred Washburne, West Springfield. Foundry Dept., The Sargent Co., New Haven. *96 Chapel St., New Haven, Ct.*

7—*1

1890.

John Young Jewett, C. E. (Dartmouth, 1895), Gilford. Civil Engineer, Dam and Aqueduct Dept., Metropolitan Water Board, Boston. *11 Prescott St., Clinton, Mass.*

Joseph Franklin Preston, Hanover. Clerk. *Boston, Mass.*
Elihu Quimby Sanborn, Webster. Machinist. *Contoocook.*
Clarence Ira Slack, Norwich, Vt. With Vermont Marble Co. *West Rutland, Vt.*

4—

1891.

Ernest Gowell Cole, Hampton. Partner, J. A. Lane & Co., General Store. *Hampton.*
Russell Marden Everett, Chester. Teacher of Mathematics, Broaddus Classical and Scientific Institute. *Clarksburg, W. Va.*
Edward Payson Stone, Canaan Center. Chemist, Magnolia Plantation, Lawrence, La. *Canaan Center.*

3—

1892.

Percey Lovejoy Barker, C. E. (Dartmouth, 1894), Milford. Civil Engineer, Boston & Maine R. R. *16 Bancroft St., Worcester, Mass.*
Fred Driggs Fuller, Hanover. Assistant Chemist, New York Agricultural Experiment Station. *Geneva, N. Y.*
Arthur Bennerzett Hough, Lebanon. Farmer. *Lebanon.*
Edward Munroe Stone, C. E. (Dartmouth, 1894), Marlborough. Civil Engineer. With L. W. Burt, C. E. *39 Pearl St., Hartford, Ct.*

4—

1893.

Wilton Everett Britton, Keene. Horticulturist, Connecticut Agricultural Experiment Station. *801 Orange St., New Haven, Ct.*
Frank John Bryant, Enfield. Teacher. *Lebanon.*
Charles Elbert Hewitt, M. M. E. (Cornell, 1895), Hanover. Member of firm of Sheehan & Hewitt, Electrical Engineers. *123 Third St., Newburgh, N. Y.*
Charles Lincoln Hubbard, M. E. (1895), Fitzwilliam. Mechanical Engineer with Prof. S. H. Woodbridge, 85 Water St., Boston. *Needham, Mass.*
Orrin Moses James, Northwood. Civil Engineer. *Northwood Narrows.*
Arthur Whitmore Smith, M. S. (Wesleyan Univ., 1895), Norwich, Vt. Expert Physical Assistant in Nutrition Investigations, in the Office of Experiment Stations, in the U. S. Dept. of Agriculture. *301 College St., Middletown, Conn.*

6—

1894.

Bert Sargent Brown, Hanover. Foreman. *St. Johnsbury, Vt.*
Fred Willis Gunn, Keene. Electrician, Fall Mountain Paper Co. *Bellows Falls, Vt.*
Frederick William Howe, Hollis. Professor of Chemistry. *State Normal School, Framingham, Mass.*

3—

1895.

Frank Stanley Adams, Gilsum. *East Greenwich, R. I.*
Frank Clifton Britton, Keene. Manager of Creamery. *West Stewartstown.*
Henry Elmer Hill, Plainfield, Vt. Farmer. *Plainfield, Vt.*
Charles Arthur Trow, Mt. Vernon. 2d Regiment U. S. Volunteer Engineers.

4—

1896.

Lewis Harris Kittredge, Keene. With New York Belting and Packing Co. *Passaic, N. J.*

1—

1897.

Harlan Winifred Barney, Grafton. Farmer. *Grafton.*
Carrie Augusta Bartlett, Lee. Teacher. *Lee.*
Mary Blaisdell Bartlett, Epping. Teacher. *Epping.*
Walter French Buck, Manchester. Instructor in Business College. *Salem, Mass.*
Arthur Willard Colburn, Dracut, Mass. Farmer. *Dracut, Mass.*
Carrie Lydia Comings, Durham. Teacher. *Durham.*
Irving Lyford Dennett. Machinist. *Elkhart, Ind.*
Mrs. Irving L. Dennett (*nee* Comings). *Elkhart, Ind.*
Elwin Henry Forristall, Columbia. Assistant Agriculturist, Experiment Station. *Durham.*
Leslie David Hayes, Durham. Instructor in Manual Training. *Portland, Me.*
John Norton Hunt, Peterborough. Machinist. *Marlboro, Mass.*
Ellery Dunbar Jenkins, Lee. Chemist of Lowell Fertilizer Co. *Lowell, Mass.*
Woodruff Mason, Stamford, Ct. Medical Student, Columbia University. *New York, N. Y.*
Roscoe Hart Shaw, Milton. Student of Chemistry. *Zurich, Switzerland.*
Charles William Vickery, Dover. *Dover.*

Delbert Amos Wheeler, South Ashburnham, Mass.
Littleton Common, Mass.
Everett Sidney Whittemore, Colebrook. Business. *Clinton, Mass.*
17—

1898.

*Richard Cole Butterfield, Westmoreland.
Helen Buzzell, Lee. *Lee.*
Bernice Elizabeth Caverno, Lee. *Lee.*
Burton Albert Corbett, Colebrook. Farmer. *Colebrook.*
Alfred Caverly Durgin, Lee. *Lee.*
James Alfred Foord, Walpole. Student Cornell University.
Ithaca, N. Y.
John William Fullerton, Somersworth. *Somersworth.*
Arthur Given, Durham. Assistant Chemist, Experiment Station.
Durham.
Edward Henry Hancock, Belmont. Machinist. *Durham.*
Mabel Lucy Hayes, Durham. Teacher. *Brattleboro, Vt.*
Tomokichi Hirokawa, Iamabari, Japan. Student Mass. Institute of Technology. *Boston, Mass.*
Harry Clinton Mathes, Newmarket. Clerk. *Dover.*
Herbert Fisher Moore, Penacook. Student Cornell University.
Ithaca, N. Y.
Gerry Austin Morgan, Goffstown. *Goffstown.*
Harry Putnam Richardson, Milford. Farmer. *Milford.*
Fred Dexter Sanborn, Ashland. *Ashland.*
Fred Webster Smith, Franklin Falls. *Franklin Falls.*
Benamin D. Tolles, Somersworth. *Somersworth.*

TWO YEARS' COURSE IN AGRICULTURE.

Lyman Charles Stratton, Hollis. Farmer. *Hollis.*
Charles Welsey Martin, Durham. Student N. H. College. *Durham.*
George Henry Wheeler, Temple.

SUMMARY.

Graduates, Bachelors of Science, 1871-97 inclusive	192
Graduates, Two Years' Course	3
Agriculturists	35
Business pursuits	46
Chemists	8
Clergyman	1
Civil, Mechanical, and Electrical Engineers	15
Editor	1
Lawyers	4
Manufacturers and Mechanics	13
Physicians	13
Post-Graduate Students	6
Teachers	10
Unclassified	5
Unknown	19
Weather Bureau	7
Twice Classified	2
Dead	13

CALENDAR

1899

JANUARY.

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

FEBRUARY.

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

MARCH.

			1	2	3	4
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APRIL.

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MAY.

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JUNE.

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JULY.

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30	31					

AUGUST.

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SEPTEMBER.

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OCTOBER.

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NOVEMBER.

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DECEMBER.

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31						

COLLEGE CALENDAR.

1898.

September 8. First term of fifteen weeks began—Thursday morning.

December 21. First term ends—Wednesday night.

Winter Vacation of Three Weeks.

1899.

January 12. Second term of ten weeks begins—Thursday morning.

March 22. Second term ends—Wednesday night.

Spring Vacation of One Week.

March 30. Third term of ten weeks begins—Thursday morning.

June 5-6. Examinations for admission—beginning Monday at 9 a. m.

June 6. Annual examinations close—Tuesday noon.

June 6. Smyth Prize Reading and Speaking—Tuesday evening.

June 7. Commencement—Wednesday.

Summer Vacation of Thirteen Weeks.

September 5-6. Examinations for admission—beginning Tuesday at 9 a. m.

September 7. First term of fifteen weeks begins—Thursday morning.

December 20. First term ends—Wednesday night.

Winter Vacation of Three Weeks.

1900.

January 11. Second term of ten weeks begins—Thursday morning.

March 21. Second term ends—Wednesday night.

CONTENTS.

NEW HAMPSHIRE COLLEGE

AGRICULTURAL EXPERIMENT STATION.

NINTH ANNUAL REPORT

November 1, 1896, to October 31, 1897.

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS.

AGRICULTURAL EXPERIMENT STATION.

DURHAM, N. H.

BOARD OF CONTROL.

HON. FRANK JONES, *Chairman,* Portsmouth.
HON. GEORGE A. WASON, New Boston.
CHARLES W. STONE, A. M., *Secretary,* Andover.
HON. JOHN G. TALLANT, Pembroke.
PRES. CHAS. S. MURKLAND, *ex officio,* Durham.

THE STATION COUNCIL.

PRES. CHAS. S. MURKLAND, A. M., PH. D., *Acting Director.*
FRED W. MORSE, B. S., *Vice-Director and Chemist.*
FRANK WM. RANE, B. AGR., M. S., *Agriculturist and Horticulturist.*
CHARLES H. PETTEE, A. M., C. E., *Meteorologist.*
HERBERT H. LAMSON, M. D., *Bacteriologist.*
CLARENCE M. WEED, D. SC., *Entomologist.*

ASSISTANTS.

LEIGH HUNT, B. S., *Assistant Agriculturist and Horticulturist.*
CHARLES D. HOWARD, B. S., *Assistant Chemist.*
WILLIAM F. FISKE, *Assistant Entomologist.*
ELWIN H. FORRISTALL, B. S., *Superintendent of Farm.*
CLEMENT S. MORRIS, *Clerk.*

The Bulletins of this station are sent free to any resident of New Hampshire, upon application.

NINTH ANNUAL REPORT.

The ninth annual report of the New Hampshire College Agricultural Experiment Station, for the year ending November 1, 1897, is hereby respectfully submitted. The reports of the departments will be found in Bulletin 48, published November, 1897, which will be sent to any address upon application.

CHARLES S. MURKLAND,
Acting Director.

ANNUAL STATEMENT

Of the Hatch Fund of the New Hampshire College of Agriculture and the Mechanic Arts, for the year ending June 30, 1897.

RECEIPTS.

Cash received from United States treasurer	$15,000.00

EXPENDITURES.

Cash paid for salaries	$7,378.70
labor	2,392.36
publications	787.60
postage and stationery	84.61
freight and express	172.78
heat, light, and water	519.59
chemical supplies	67.66
seeds, plants, and sundries	201.72

Cash paid for fertilizers	$245.60	
feeding stuffs	665.59	
library	136.24	
tools, implements, and machinery	780.83	
furniture and fixtures	57.56	
scientific apparatus	168.84	
live stock	496.77	
traveling expenses	125.45	
contingent expenses	1.30	
buildings and repairs	716.80	
		$15,000.00

SUPPLEMENTARY STATEMENT.

Receipts.

Cash received from the State Board of Agriculture for analysis of fertilizers, also sundry fees for water analysis	$1,243.00	
Cash received from sales of farm produce	2,029.68	
		$3,272.68

Expenditures.

Cash paid for salaries	$739.86	
labor	1,172.14	
freight and express	11.20	
chemical supplies	69.02	
seeds, plants, and sundry supplies	157.99	
feeding stuffs	145.46	
tools, implements, and machinery	78.42	
scientific apparatus	46.14	
live stock	698.67	
buildings and repairs	153.78	
		$3,272.68

REPORT OF THE VICE-DIRECTOR.

To Charles S. Murkland, Acting Director:

The work of the experiment station has been continued during the year, closely along the lines described in the last annual report. Its facilities for investigation have been notably increased by the privileges afforded in the new greenhouse, insectary, and cold-storage cellar constructed by the college from the state's biennial appropriation; and consequently the scope of its experiments for the coming year will be widened.

The station has co-operated with farmers in testing varieties of potatoes, with creameries in settling disputes about milk-testing, with lumbermen in studying the destruction of the spruce forests by insects, and with the State Board of Agriculture in the inspection of commercial fertilizers, the exposure of sales of oleomargarine, and in institute work.

The following bulletins have been published during the year:

No. 41. Potatoes: Varieties, Fertilizers, and Scab. By F. Wm. Rane and Leigh Hunt. Pages 1-14.

No. 42. Tomato Growing in New Hampshire. Notes on Tomato Breeding. By F. Wm. Rane and Leigh Hunt. Pages 15-26.

No. 43. Some Inferior Wood Ashes. By Fred W. Morse. Pages 27-30.

No. 44. The Canker Worm. By Clarence M. Weed. Pages 31-42.

No. 45. Fruit and Potato Diseases. By H. H. Lamson. Pages 43-56.

No. 46. An Experiment with a Steam Drill. Methods of Road Maintenance. By Charles H. Pettee. Pages 57-88.

No. 47. The Strawberry in New Hampshire. By F. Wm. Rane. Pages 89-114.

No. 48. Ninth Annual Report.

The following changes have occurred in the station staff:

On January 15, 1897, Mr. Ruel S. Alden resigned his posi-

tion as assistant agriculturist and farm superintendent, and the scope of Mr. Leigh Hunt's work was enlarged to include it. Mr. William F. Fiske was appointed assistant entomologist on March 21, and Mr. Elwin H. Forristall, of the class of 1897, N. H. C., was made farm foreman, on June 10. On the completion of the year, October 30, Mr. Hunt severed his connection with the station.

In the department of chemistry there have been employed temporarily, Messrs. Fred D. Fuller, Ernest B. MacCready, and Charles W. Vickery, their time being principally spent in analyzing fertilizers.

The reports of the work of the various departments of the station were published in Bulletin 48, issued in November, 1897, which will be sent to any address upon application.

FRED W. MORSE,
Vice-Director and Chemist.

NEW HAMPSHIRE COLLEGE
AGRICULTURAL EXPERIMENT STATION.

TENTH ANNUAL REPORT

NOVEMBER 1, 1897, TO OCTOBER 31, 1898.

NEW HAMPSHIRE COLLEGE

AGRICULTURAL EXPERIMENT STATION.

DURHAM, N. H.

BOARD OF CONTROL.

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CLARENCE M. WEED, D. SC., *Entomologist.*
FRANK WM. RANE, B. AGR., M. S., *Horticulturist.*
CHARLES W. BURKETT, M. S., *Agriculturist.*

ASSISTANTS.

ELWIN H. FORRISTALL, B. S., *Superintendent of Farm.*
CHARLES D. HOWARD, B. S., *Assistant Chemist.**
ERNEST J. RIGGS, B. S., *Assistant Horticulturist.*†
WILLIAM F. FISKE, *Assistant Entomologist.*
CLEMENT S. MORRIS, *Clerk.*

* Resigned October 1, 1898. † Resigned June 8, 1898.

TENTH ANNUAL REPORT.

The tenth annual report of the New Hampshire College Agricultural Experiment Station, for the year ending October 31, 1898, is hereby respectfully submitted. The reports of the department will be found upon the pages indicated in the following list:

CHARLES S. MURKLAND,
Acting Director.

ANNUAL STATEMENT

Of the Hatch Fund of the New Hampshire College of Agriculture and the Mechanic Arts, for the year ending June 30, 1898.

RECEIPTS.

Cash received from United States treasurer	$15,000.00

EXPENDITURES.

Cash paid for salaries	$8,148.88
labor	1,336.22
publications	976.20
postage and stationery	136.44
freight and express	79.19
heat, light, and water	981.33
chemical supplies	172.92

Cash paid for seeds, plants, and sundry supplies	$40.27	
fertilizers	217.80	
feeding stuffs	400.17	
library	401.45	
tools, implements, and machinery	310.64	
furniture and fixtures	66.43	
scientific apparatus	621.18	
live stock	32.60	
traveling expenses	261.38	
contingent expenses	75.77	
building and repairs	741.13	
		$15,000.00

SUPPLEMENTARY STATEMENT.

Receipts.

Cash received from the State Board of Agriculture for analysis of fertilizers	$627.00

Expenditures.

Cash paid for salaries	$286.45	
Balance	340.55	
		$627.00

We, the undersigned, duly authorized auditors of the corporation, do hereby certify that we have examined the books and accounts of the New Hampshire College Experiment Station for the fiscal year ending June 30, 1898; that we have found the same well kept and classified as above, and that the receipts for the year from the treasurer of the United States are shown to have been $15,000, and the corresponding disbursements $15,000; for all of which proper vouchers are on file and have been by us examined and found correct.

Also, that the receipts from fertilizer analyses and farm receipts have been duly expended and vouched for, as per supplementary statement.

And we further certify that the expenditures have been solely for the purposes set forth in the act of congress approved March 2, 1887.

(Signed)
JOHN G. TALLANT,
CHARLES S. MURKLAND,
Auditors.

Durham, N. H.

REPORT OF THE VICE-DIRECTOR.

To Charles S. Murkland, Acting Director:

The work of the Agricultural Experiment Station during the year ending October 31, 1898, has been conducted with no drawbacks excepting the wet spring season, which prevented the execution of some field experiments by delaying the preparation of the land until too late to secure satisfactory results.

Two important changes have been made in the policy and organization of the station.

At the beginning of the year, in accordance with the vote of the Board of Control, the college farm, herd, and creamery were made financially independent of the experiment station, while remaining under the same management as last year; and field experiments were limited to definite areas, instead of being conducted in every field that was tilled. By this means the items for labor, food-stuffs, and tools charged to the Hatch fund have been much reduced, while the supplementary statement no longer contains credits for farm produce sold.

On September 15, the Department of Agriculture and Horticulture was divided into two distinct departments, Professor Rane remaining at the head of the Department of Horticulture and Associate Professor Burkett assuming charge of the Department of Agriculture. The step is too recent to affect the work of this year.

The following changes have occurred in the staff of the station:

January 1, Mr. Ernest J. Riggs, B. S., of Ohio, was appointed assistant horticulturist, and continued in that position until June 8, when he resigned in order to return to Ohio.

July 1, Mr. Charles W. Burkett, M. S., of Ohio, was appointed assistant agriculturist, and on September 15 became head of his department.

October 1, Mr. Charles D. Howard, B. S., resigned his position as assistant chemist to accept a better position at the West Virginia Experiment Station.

Several important improvements have been made in the buildings, three fourths of the cost of which was borne by the farm. These improvements include stalls and pens for young cattle and calves in the new stable, a cement floor in the manure cellar under it, and a wash-room adjoining it. A small stable containing three stalls was fitted up in the old barn for experimental use.

The bulletins prepared during the year are as follows:

No. 49. Inspection of Fertilizers. By Fred W. Morse.

No. 50. Dehorning Cattle. By F. Wm. Rane and H. H. Lamson.

No. 51. Sweet Corn for New Hampshire. By F. Wm. Rane.

No. 52. Growing Muskmelons in the North. By F. Wm. Rane.

No. 53. The Farm Water Supply. By Fred W. Morse.

No. 54. The Winter Food of the Chickadee. By Clarence M. Weed.

No. 55. The Feeding Habits of the Chipping Sparrow. By Clarence M. Weed.

No. 56. Poisonous Properties of Wild Cherry Leaves. By Fred W. Morse and Charles D. Howard.

No. 57. Forage Crops. By F. Wm. Rane. (In press.)

No. 58. Cost of Raising Calves. By Fred W. Morse. (In press.)

No. 59. Tenth Annual Report.

The reports of the different members of the Station Council are given in the succeeding pages.

During the year the Department of Chemistry has been assisted a portion of the time by Messrs. Charles W. Vickery, B. S., Arthur Given, B. S., and Harry E. Barnard, class of '99, N. H. C. It is the policy of this department to respond as promptly as possible to the applications from the public for analyses of fertilizers, and other substances pertaining to agriculture. This class of work and the fertilizer inspection for the State Board of Agriculture have required about one half of the department's time. Its scientific investigations have, therefore, been continued from year to year in order to obtain results that will justify a bulletin. Besides a report on fertilizer analyses, the department has issued a bulletin on the farm water supply, including observations made during several years, and one on the poisonous properties of wild cherry leaves, covering the work of two successive summers.

Respectfully submitted.

FRED W. MORSE,
Vice-Director and Chemist.

PUBLICATIONS OF THE EXPERIMENT STATION.

During the ten years since its organization the New Hampshire College Agricultural Experiment Station has issued fifty-nine bulletins in regular series, six annual reports, and two special bulletins. Press bulletins have also been prepared for the use of the newspapers; but they are simply abstracts of the regular bulletins, and are not for general distribution, since they contain no new matter.

The list of regular bulletins is as follows:

No. 1. Ensilage.
No. 2. Feeding Experiments.
No. 3. When to Cut Corn for Ensilage.
No. 4. The Science and Practice of Stock-Feeding.
No. 5. Fertilizers and Fertilizing Materials.

No. 6. Experiments with Fertilizers.

No. 7. Test of Dairy Apparatus.

No. 8. Feeding Experiments. Part 1. Principles of Feeding. Part 2. Corn Meal, Middlings, Shorts, and Cotton-Seed compared.

No. 9. Effect of Food upon Milk.

No. 10. Co-operative Fertilizer Experiments.

No. 11. Pig Feeding. Part 1. Results of Feeding Skim Milk and Corn Meal versus Corn Meal and Middlings. Part 2. Digestion Experiment.

No. 12. Fertilizer Experiments.

No. 13. Part 1. Effect of Food on Butter. Part 2. Effect of Food on Quantity of Milk. (Out of print.)

No. 14. Ensilage in Dairy Farming.

No. 15. Patent Cattle Foods.

No. 16. Effect of Food on Composition of Butter Fat.

No. 17. Stock Feeders' Guide.

No. 18. Effect of Food on Milk.

No. 19. Spraying Apples and Pears against Fungi.

No. 20. Effect of Food on Milk. Feeding with Fats.

No. 21. Farm-yard Manures and Artificial Fertilizers.

No. 22. Prevention of Potato Blight.

No. 23. Some Dangerous Fruit Insects.

No. 24. The Flow of Maple Sap.

No. 25. The Composition of Maple Sap.

No. 26. Analyses of Fertilizers and Wood-Ashes.

No. 27. Spraying Experiments in 1894.

No. 28. Remedies for the Horn Fly.

No. 29. Remedies for Flea Beetles.

No. 30. An Experiment in Road Making.

No. 31. Seventh Annual Report. 1895.

No. 32. Studies of Maple Sap.

No. 33. Two Shade-Tree Pests.

No. 34. Surface and Sub-Irrigation out of Doors.

No. 35. The Codling Moth and the Apple Maggot.

No. 36. Analyses of Three Common Insecticides.

No. 37. Crimson Clover.

No. 38. The Tent Caterpillar.
No. 39. The Army Worm.
No. 40. Eighth Annual Report. 1896.
No. 41. Potatoes: Varieties, Fertilizers, Scab.
No. 42. Part 1. Tomato Growing in New Hampshire. Part 2. Notes on Tomato Breeding.
No. 43. Some Inferior Wood Ashes. Adulterated Paris Green.
No. 44. The Canker Worm.
No. 45. Fruit and Potato Diseases.
No. 46. Part 1. An Experiment with a Steam Drill. Part 2. Methods of Road Maintenance.
No. 47. Strawberries in New Hampshire. (Out of print.)
No. 48. Ninth Annual Report. 1897.
No. 49. The Inspection of Fertilizers in 1897.
No. 50. Dehorning Cattle.
No. 51. Sweet Corn for New Hampshire.
No. 52. Growing Muskmelons in the North.
No. 53. The Farm Water Supply.
No. 54. The Winter Food of the Chickadee.
No. 55. The Feeding Habits of the Chipping Sparrow.
No. 56. Poisonous Properties of Wild Cherry Leaves.
No. 57. Forage Crops. (In press.)
No. 58. Cost of Raising Calves. (In press.)
No. 59. Tenth Annual Report. 1898.

It will be noticed that, beginning with 1895, the annual reports of the station have been issued as bulletins in the regular series. Previous to 1895, the annual reports were issued as Part II of the report of the college, and were numbered as follows:

First Annual Report. 1889.
Second Annual Report. 1890.
Third and Fourth Annual Reports. 1892.
Fifth Annual Report. 1893.
Sixth Annual Report. 1894.

The Third and Fourth Annual Report is now out of print, but aside from the financial statements, it contains no matter

outside the regular bulletins, since it includes only the bulletins issued during those years.

The two special bulletins issued were intended for local distribution, and contained merely an explanation of the weather signals displayed at the station.

DEPARTMENT OF AGRICULTURE AND HORTICULTURE.

The department remained the same as last year until September 15, when it was divided, and Mr. C. W. Burkett was promoted to take charge of the department of agriculture. This report as regards agriculture, therefore, ends upon September 15, last, while that of horticulture is given up to the present time.

The work during the past year has been mainly along agricultural lines. The results with various fodder crops, which have been grown the past three seasons, has been already published in Bulletin 57, and the reader is referred to it for these crops. A general study of rotations for the college farm has been outlined, and although it does not come directly under the head of experimental work, it is to a great degree of that nature. During the latter part of the year, the time of the head of the department has been taken up mainly in getting the agricultural work in shape, either for publication or to turn over to the new agriculturist. A few further experiments follow:

Destroying the Oxeye Daisy.

The oxeye daisy easily disseminates itself wherever farming is neglected. It can be kept from farms, however, if precaution is exercised. We have seen several farms in New Hampshire that are completely surrounded with this weed, but are kept absolutely free from it.

During the past few years the writer has had considerable experience in endeavoring to overcome this pest, in the course of which the following experiment was made. One method

Fig. 1.— Daisies in newly seeded grass field. (Not on the College farm.)

of keeping it from spreading commonly practised is to cut the hay early, and thus avoid the maturing of the seeds. In order to ascertain just how elastic this period might be, in July, 1897, a number of daisy blossoms were collected for study. The date of the opening of each blossom was noted, and specimens were taken at various periods from this time on.

The following tables show the results: Table I gives the date when the blossoms first opened and when they were collected, thus showing the number of days open. It also gives the number of seed tested for each period, and the number that germinated, thus showing the percentage of germination.

TABLE I.

No.	Opened.	Collected.	Days in bloom.	No. seed tested.	No. germinated.	Per ct. germ.
1	July 8	July 10	2 days.	730	.....	.....
2	" 8	" 13	5 "	730	.....	.....
3	" 8	" 14	6 "	780	.....	.....
4	" 8	" 16	8 "	930	.....	.....
5	" 20	" 29	9 "	930	.....	.....
6	" 20	" 30	10 "	380	.....	.....
7	" 8	" 20	12 "	1,030	7	.007
8	" 8	" 23	15 "	1,180	23	.020
9	" 8	" 28	20 "	930	28	.030
10	Dead ripe.	.....	Unknown.	1,230	324	.260

Table II shows only the results of those which germinated, and the date and number of seed used at each test. These observations would lead us to believe that it takes at least twelve days for seed maturity of the daisy after it first blossoms.

TABLE II.

SEED-TESTED.	No. 10.		No. 9.		No. 8.		No. 7.	
DATE.	Seed in test.	Germ-inated.	Seed in test.	Germ-inated.	Seed in test.	Germ-inated.	Seed in test.	Germ-inated.
October 18....	50	8	50	3	50	.....	50	.....
November 1....	20	2	20	.....	20	.....	20	.....
December 6....	60	.....	60	.....	60	.....	60	.....
February 4....	100	20	100	.....	100	1	100	2
March 10....	200	8	200	2	200	1	200	.....
April 15....	800	286	500	23	750	21	600	5
Total.....	1,230	324	930	28	1,180	23	1,030	7

Figure 1 is a photograph of a field adjoining the college farm, and represents the first growth from newly seeded ground. After the daisy matured there was such a good growth of timothy that the presence of the daisy could not be detected except upon close examination.

LIMING.

A number of experiments have been carried on to test the value of lime when applied to our soil.

Experiment 1. On July 9, 1896, we completed the preliminary work upon an old meadow. The field had been in grass for an indefinite number of years, and was practically exhausted. It was plowed up and staked off into plots, all of which were prepared alike. The plant food used was commercial fertilizer. Three series of plots of two each were used in the experiment, one in each being limed at the rate of one ton per acre, while the other was used as a check. The soil is a clay loam, rather low and not very well drained,—fairly representative of the grass lands in this section of the state. The following data show the results for the past two seasons, in each case on one acre of land.

Plot.	Kainit.	Acid phosphate.	Lime.	Yield per acre. 1897.	Yield per acre. 1898.	Two-year average.
1	800 lbs.	600 lbs.	.....	3,480 lbs.	1,600 lbs.	2,540 lbs.
2	800 "	600 "	2,000 lbs.	4,520 "	1,760 "	3,140 "
	Balance favor of lime			1,040 lbs.	160 lbs.	600 lbs.

Plot.	Muriate potash.	Acid phosphate.	Lime.	Yield per acre. 1897.	Yield per acre. 1898.	Two-year average.
3	200 lbs.	600 lbs.	.....	3,360 lbs.	1,440 lbs.	2,400 lbs.
4	200 "	600 "	2,000 lbs.	4,440 "	2,080 "	3,260 "
	Balance favor lime			1,080 lbs.	640 lbs.	860 lbs.

Plot.	Muriate potash.	Acid phosphate.	Nitrate soda.	Lime.	Yield per acre. 1897.	Yield per acre. 1898.	Two-year average.
5	200 lbs.	600 lbs.	120 lbs.	.....	3,800 lbs.	2,520 lbs.	3,160 lbs.
6	200 "	600 "	120 "	2,000 lbs.	4,280 "	2,520 "	3,400 "
	Balance favor of lime				480 lbs.	.....	240 lbs.

From these results it is evident that the lime has been more effective in the first season's growth.

Experiment 2. This was an experiment with *versus* without lime, and was begun on potato land in the spring of 1896. As the season was unfavorable, and the tubers rotted badly, no notes were taken. The ground, which was a lightish loam, was plowed for the first time in a number of years. The following year the land was planted to the Leaming variety of ensilage corn, with the following results:

Ensilage corn with lime,	16,820 lbs. per acre.
Ensilage corn unlimed,	12,180 lbs. per acre.
Difference in favor of limed,	4,640 lbs. per acre.

This yield is low for either plot, but the facts that the land had been so shortly reclaimed, and that commercial fertilizers were depended upon entirely, no humus being added, account for it.

During the last cultivation of the corn, the land was seeded to clover and grass, to carry the experiment still another season. The weight of grass taken from these plots this season was, for the limed, 2,975 pounds, and for the unlimed, 2,660 pounds,—a difference of 315 pounds in favor of the limed land. The second crop was pastured, and therefore is not included in the above weights.

Experiment 3. This experiment was undertaken last spring through the assistance of two students in the Two Years' Course in Agriculture, Mr. C. W. Martin and Mr. G. H. Wheeler, to ascertain if the various fields of the college farm would be helped by liming. The work carried out in the main was to apply the tests recommended by Professor Wheeler of Rhode Island,* "How to Ascertain if a Soil will be Helped by Liming." The method, which is simple and should be understood by every one, is as follows:

"A tablespoonful or more of soil is placed in a tumbler or cup and moistened with sufficient water to make the mass of about the consistency of a thick paste. It is best to allow it to stand for from fifteen to twenty minutes before making the test, though it may be made at once. With a knife blade part the soil and introduce one end of a slip of *blue litmus paper,*† which may conveniently be one half to three quarters of an inch wide and two inches long, press the soil about the paper, and after from two to five minutes remove the paper without tearing it, rinse off the adhering soil with water and note whether it still retains a blue tint or has become positively red. If the paper has been strongly reddened, it may be concluded that lime will probably benefit many crops which may be grown upon the soil. If the soil has a marked reddish tint, as is sometimes the case, it may be better to bring

* Bulletin 46, R. I. Agricultural Experiment Station.

† A few cents will buy enough at any apothecary store to make many tests.

but one side of the paper in contact with it, and if a red color comes through to the other side it may be concluded that the soil is acid. In all cases care must be taken not to handle the end of the paper which is used for making the test, since the touch of the fingers may redden it and thus one might be deceived.

"In case a soil contains any considerable excess of carbonate of lime and magnesia, the humus is mostly combined with lime and magnesia, and in such a case if a teaspoonful of soil is stirred into a glass of water to which a few drops of *ammonia water** have been added, and the whole set aside for some hours, the liquid which remains at the top will be nearly colorless, but where lime and magnesia are lacking in a soil the liquid has usually a dark brown or black appearance, the intensity of color depending upon the amount of soil taken, and of course upon its need of lime."

The above instructions were carried out upon a number of fields by each student. In some cases where the ground is rolling and conditions vary, samples were taken, as, for example, from the high, medium, and low ground. Both tests were made, but upon compiling the notes, it was found that both the *litmus* and *ammonia water* tests practically showed the same results. Consequently, but one table is necessary.

Field.	Elevation of ground.		
	Low.	Medium.	High.
McDaniel	Decidedly acid	Acid	Neutral.
Creamery	Decidedly acid		
North	Decidedly acid		Acid.
Heater	Decidedly acid		Slightly acid.
Experiment	Slightly acid	Acid	
East of athletic ground	Decidedly acid		
Thompson	Decidedly acid		
Black swamp			Slightly acid.
Black swamp + Lime, 1,500 lbs. — corn	Very slightly acid		Slightly acid.
Black swamp + Lime, 1,500 lbs. — potatoes	Very slightly acid		

* This is to be had of any apothecary for a few cents.

SEEDING GRASS LANDS WITH *vs.* WITHOUT A NURSE CROP.

That grass lands can be seeded, when known to be perfectly free from weed seeds, without a nurse or protective crop, and with the best of results, there is no question. We quote from experiments carried on by Henry at the Wisconsin Experiment Station, in order to impress the importance of thorough cultivation as well as to show under what conditions success is assured.

* "1. The land must be quite free from weed seeds. If there are many weed seeds in the ground, these can be destroyed by summer-fallowing or by 'freshing' the ground several times before the grass seeds are sown. It positively will not do to sow grass where the ground is foul with weed seeds.

"2. The land should possess at least fair fertility in order to produce early springing and rapid growth of the young grass plants from the very beginning.

"3. The land must be very carefully prepared. In this there is nothing but gain to the husbandman by doing his work well. Every inch of the soil should be gone over again and again, and the surface rendered as smooth as a table and as fine as an onion bed. We have been very careless in the past in regard to the proper treatment of grass lands, and must improve in the future if we desire the heavy crops possible.

"4. It is well to sow large quantities of grass seed—two or three times the usual amount. In seeding, the field should be crossed both ways, if possible, so as to insure entire absence of skips or breaks in the evenness of the young sward.

"5. It is probably best, although we have not fully demonstrated the fact, to sow grass and clover seed very early in the spring time. Our returns for the present year, and those of some of our student correspondents, show the beneficial effects of very early seeding.

"6. Finally, a matter of much importance is that of checking the growth of weeds, which will annoy more or less in spite of all precautions. There being no grain crop to check

* Thirteenth Annual Report Wis. Agricultural Experiment Station. 1896

Fig. 2.—Seeding with *vs.* without a nurse crop. This side the measuring stake represents a strip seeded without, while that beyond is seeded with barley. First crop July 16th, 1897.

this growth, weeds luxuriate amazingly in the young seeding of grasses and clovers. When the weeds reach a height of six inches, the mower should be put into the field with the cutter bar set about four inches high. It is very light, rapid work trimming off the weeds, and the field is then most attractive in its even carpet of green. The young grass and clover plants are hurt far less by this mowing than are the weeds, and, their leaves shooting up, overtop the weeds, and hiding them from the sun choke them down. Sometimes, the mowing of the weeds must be repeated."

From the above it is readily seen that the average grass lands of New Hampshire, in order to produce a crop of grass and clover without a protective crop, must be judiciously handled.

An experiment was undertaken in the spring of 1897 on land that had been thoroughly cultivated with ensilage corn the two preceding years, and therefore was fairly clean. The ground was plowed and dressed with a fair coating of barnyard manure, supposed to be above the average as regards purity from weed seeds. It was worked in with a cutaway harrow. The soil was a heavy clay, but fairly well-drained, somewhat rolling; typical of the grass lands of this section. The following mixture of grass seed was used per acre: 5 pounds of alsike clover, 7 pounds choice red clover, 5 pounds of red-top and 12 of timothy or herd's-grass. A large plot of this, extending across the field, was staked off, and the remainder sown to barley, as a nurse crop, at the rate of three pecks per acre.

The season was favorable for grass, and on July 16, the barley was cut and cured for fodder. Figure 2 is a half-tone from a photograph taken on the above date, and shows the comparative heights of the two seedings. The measuring stake in the center of the photograph stands upon the dividing line of the two plots. The grass in the barley, as can be seen in the cut, had made an excellent growth, being a foot high and very heavy. The grass grown without the barley, as shown in the fore part of the photograph, was much

smaller, and although the weeds were cut back once, was by no means so far advanced. The ragweed seemed to be the most troublesome in patches. The yield of barley and young grass in the first cutting was at the rate of 2 tons 372 pounds per acre when cured. The second crop from this same ground, which was clover, was cut during September, and put directly into the silo. This weighed in the green state at the rate of 3 tons, 1475 pounds per acre, or allowing fifteen per cent discount for curing, 3 tons, 353 pounds.

The plot without barley was cut on August 13, and yielded at the rate of 1 ton, 680 pounds of hay per acre. The true grasses were more in evidence in this plot, although there was a good catch of clover. The grass on the plot was not cut for a second crop.

During the present season it was found that the plot without the barley was the first to advance. It made a very rank growth. On June 1, the grass lodged badly, and was much heavier than the remainder of the field. It was cut on June 23, and the rate of yield for each per acre was as follows: For land stocked with barley, 2 tons, 1219 pounds, and for that without barley 4 tons, 1600 pounds. The second crop was pastured and no weights taken.

This experiment shows that although the crop with barley exceeded that without the first season, it came nearer being equal when extended over two years. Comparing the total weights for the two seasons the excess in favor of that with barley is 1 ton, 1662 pounds. I have no data to show whether if the experiment were continued longer, the plot without the nurse crop would fully equal the other or not.

An experiment was made by cutting a large strip across a newly seeded piece when the barley was but two thirds grown. This accomplished practically nothing, however, as the second crop of grass on this strip could not be distinguished from the rest of the field. The barley thus cut was used for soiling.

Last spring a number of plots were prepared for sowing various leguminous plants without a nurse crop. It so hap-

pened that the ground previously contained witch grass, which entirely choked out the various varieties of clover.

Conclusions:

1. Where it is positively known that the land is fertile and free from weed seeds, also that the fertilizer used is not contaminated, grass can be grown with success without a nurse crop.

2. Where barn-yard manures are used, or where the soil is not thoroughly cleansed of weeds, the nurse crop is an advantage in that it checks the weedy growth; also, if cut early for hay, as is common in New Hampshire, the grass has more time to develop, usually resulting in a good second crop.

3. It is but little more work to cut the nurse crop than under ordinary conditions it would be to cut the weeds. In the former case the green crop would compensate for the work.

4. The nurse crop takes nourishment from the soil that might otherwise go to the grass, but nothing is lost, as its value is realized from the crop itself.

5. Should the largest returns be expected the first season, or in case of a rotation in the earlier years of the rotation, it is better to use the nurse crop, unless the conditions are ideal for sowing grass seed by itself.

6. When witch grass is present it is practically impossible to get a fair catch of clover without a nurse crop.

7. From these experiments, taking everything into consideration, we believe that for our general New Hampshire conditions it is advisable to use the nurse or protective crop.

Top-Dressing Grass Lands.

In the spring of 1897 an experiment was carried on in top-dressing a field that apparently was about run out. The yield of hay would but pay for the labor. Two one-acre plots were selected, and one was dressed in the spring with the following mixture of fertilizers,—100 pounds of nitrate of soda, 100 pounds of dissolved bone black, and 50 pounds of muriate of potash. The other was utilized as a check.

The season was wet and very favorable for the grass crop. The yield from the fertilized plot was 3,840 pounds, and from the check plot, 2,930. making a difference in favor of the former of 910 pounds. These same plots were cut the present season without further treatment, giving 2,420 pounds from the fertilized plot, and 1,600 pounds from the other,—820 pounds in favor of the fertilized.

Sowing Crimson Clover in Different Months.

An experiment has been conducted for studying the result upon this crop when planted at different times during the growing season. Sowings were made June 29, July 31, August 31, October 10, and November 6. In the late fall a representative specimen of each of the seedlings was photographed, as shown in Figure 3. From these it is seen that the plants attain a fair size when planted early. All were unable to withstand the winter climate. An occasional plant in each of the earlier sowings came through and blossomed. As was shown in Bulletin No. 37 of this station, this is more proof that crimson clover does not withstand our winter climate. Its main value is in its growth of the first season, and it must therefore be considered as an annual with us. As a crop for seeding in fruit plantations, simply for the additional food value of the plantation and to keep the soil from washing during winter, it is valuable; but even here the seeding should be done early in August in order to obtain desirable results. Comparing crimson clover with the medium red variety, there seems to be little if any gain in its use. If the medium red and alsike are mixed, our experience shows that because of their ability to withstand the winters, while in all other respects they answer the same purpose, they are equally valuable if not more so.

Thomas Slag *vs.* Redondite as a Fertilizer.

A comparative test of these two phosphoric acid fertilizers was undertaken in the late spring of 1897, upon land seeded to grass. The nitrogenous and potash fertilizers were applied in equal quantities on both plots, and consisted of 80 pounds of nitrate of soda and 400 pounds of kainit per acre.

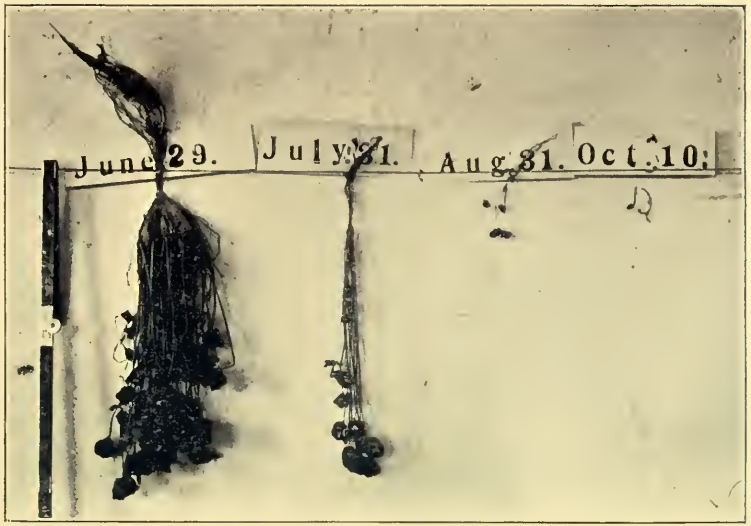


Fig. 3.—Crimson clover sown at different times throughout the season.

The Thomas slag was used at the rate of 160 pounds per acre on plot 1. Plot 2 was equally divided. Raw redondite was used on one half at the rate of 80 pounds per acre, and roasted redondite at the rate of 40 pounds per acre on the other.

The barley used as a nurse crop was cut on September 7 with the following yields: Thomas slag plot, at the rate of 1,312 pounds, raw redondite, 1,520 pounds, and roasted redondite, 1,424 pounds per acre. The present season these same plots were weighed at haying time, with the following results: Thomas slag, 3,704 pounds, raw redondite, 4,320 pounds, and roasted redondite, 3,248 pounds per acre.

In each year, as is shown in the data, the raw redondite gave the greatest yield. Of the other two, the roasted redondite exceeded the Thomas slag by 112 pounds per acre in the first year, while in the present season it was reversed, the Thomas slag yielding 456 pounds per acre more than the other. From this experiment, therefore, their values are in the following order,—raw redondite, first; Thomas slag, second, and roasted redondite, third.

Fruit Calendar for 1898.

On the whole this has been a fruit year. Doubtless other seasons have given larger yields of special kinds, as, for example, the over-abundant apple crop of 1896, the pear crop of last season, etc. However, taking into consideration fruits of all kinds from the apple to the smallest bush fruits, the season has been an ideal one in many respects.

The apple crop has varied in different sections, but in general has been productive. The fruit on the average is large, well-colored, and comparatively free from blemishes. Where 200 barrels were expected from the college farm, the yield was much nearer 300 barrels. The fall and summer fruit was very fine and productive, and brought good prices. It is a mistake not to market the fall apples, even though only a few trees are grown; if the fruit is well graded and nicely packed, it brings paying prices. Even the poorest apples, well sorted, netted us $1.50 per barrel this season.

When traveling in the northern part of the state the writer was completely surprised to find to what an extent the apple is grown. From Colebrook, Mr. Jordan has been shipping fall apples to Minneapolis and other places in the Northwest by the car-load, netting $1.75 per barrel. About Lancaster apples are doing well; at the State Grange fair at Tilton, J. D. Howe and Son of this place made a very fine display. All of the fruit in this northern section is highly colored and beautiful. Mr. Howe finds a home market for all he can raise. Another Lancaster man, Mr. B. C. Morse, agrees with Mr. Howe that they now have a winter apple that is destined to revolutionize the apple industry in this section. The variety is the Bethel. Its principal recommendations are its hardiness, flavor, and good keeping qualities. A description and figure of this fruit will be given in some future report.

This section is too far north for the Baldwin, which matures only under sheltered conditions. Mr. Howe sends me the following list of varieties, all of which, he says, do well with him. They are named in order of their ripening: Yellow Transparent, Tetofskey, White Astrachan, Red Astrachan, Peach, Duchess of Oldenburg, St. Lawrence, Alexander, Fall Jenetting, Fameuse, Wealthy, Nodhead, Porter, Tolman Sweet, Bethel, McIntosh Red, Twenty Ounce, Yellow Bellflower, Northern Spy, Stark, and Ben Davis.

Pears likewise do well in the northern section of the state, the following four varieties having been recommended: Flemish Beauty, Clapp's Favorite, Louise Bonne de Jersey, and Vermont Beauty; the last Mr. Morse claims is very fine.

Of plums Mr. Howe says the Bradshaw, Canada Egg, and Lombard are as good as any, but Moore's Arctic, Saratoga, Bonne Lee Anne, Green Gage, Chautauqua, Saunders, Abundance, and Damson all do well.

Mr. Morse reports that the three varieties of cherries, namely, the Ostheim, Early Richmond, and Nindswerth, are all valuable.

At the Bethlehem fair, the writer saw evidences of no little horticultural progress. The fruit displayed was very fine,

and the outlook for this section, situated as it is in the White Mountains, is thought to be very bright. Those experienced say that no one has yet demonstrated the possibilities with fruits here. Small fruits are being raised more and more. One man, Mr. E. E. Bishop of Bethlehem, raised four acres of strawberries the past season. Formerly this fruit came chiefly from Boston gardeners.

In the central and southern parts of the state there was a very fair crop of peaches. Mr. George Tuttle of Barrington had a crop of over 1,000 baskets, all of which were very fine. The orchard of Mr. Stratton in Hollis, which he reported last year, gave a crop this year almost as fine as that of last season. The main varieties used by both of these men are Mountain Rose and Early Crawford. Mr. Tuttle raises some Fosters and Wheatlands which he values highly. The peach rot has been very troublesome during the past season. Strawberries have been over-abundant in some markets this year. Red raspberries seemed to be scarce and brought good prices.

The main lines in horticultural work at the station during the year have been with potatoes, muskmelons, and strawberries. Much work of an experimental nature has been done in the greenhouses, all of which will be published in bulletin form.

F. Wm. Rane,
Horticulturist.

DEPARTMENT OF AGRICULTURE.

The College Herd.

The college dairy herd at present is composed of sixteen Jerseys, six pure bred and ten grades; seven Ayrshires; five Guernseys; three grade Durhams; and two grade Holsteins.

The herd has been equivalent to 309 milch cows and 94 dry cows for one month and has produced 173,011 pounds of milk and 9,376.89 pounds of butter, making an average monthly yield per head for 403 cows, 429 pounds of milk

and 23.3 pounds of butter, or 5,148 pounds of milk and 280 pounds of butter for the year. The data have been taken from the daily and weekly records of the barn and creamery, and the butter calculated by the standard formula, butter= $1+\frac{1}{6}$ fat instead of the actual weights obtained, since the latter would involve corrections for cream and milk sold.

HERD RECORD FROM NOVEMBER 1, 1897, TO OCTOBER 30, 1898

Month.	Milch cows.	Dry cows.	Pounds of milk.	Average for each milch cow.	Average for herd.	Average fat test.	Pounds of butter.
November	27	9	13,854	513	385	4.7	756.73
December.....	28	8	15,812	564	439	4.6	841.43
January.....	25	9	15,167	606	446	4.6	800.90
February	26	7	13,780	530	417	4.6	745.76
March	25	8	15,014	577	455	4.5	897.32
April	23	10	13,536	588	410	4.57	710.18
May	26	7	15,862	610	480	4.4	800.33
June	26	7	16,414	631	497	4.4	871.78
July	28	5	16,322	563	494	4.6	875.94
August	27	6	12,609	467	382	4.75	698.47
September.....	25	8	12,713	508	385	4.6	682.25
October	23	10	11,828	562	362	5.0	695.80

The work of this department during the past year was connected with that of the department of horticulture, and the record of the work is given in the report of the horticulturist.

Charles W. Burkett,
Agriculturist.

DEPARTMENT OF BACTERIOLOGY.

The work of this department during the past year has been chiefly a continuation of various lines of investigation previously begun, viz., dairy bacteriology; the study of the root tubercles of the leguminous plants, both wild and cultivated; study of the life history and treatment of black knot of plum

Fig. 4.—Fly Agaric. Poisonous.

and cherry, and the fungous diseases of the apple. Experiments in the measurement of temperatures by electrical means, and in the bacteriology of ensilage have been begun.

Edible Mushrooms.

For some time in different quarters there have been signs of an awakening interest in the study of mushrooms, especially with a view to their use as food. The writer has for several years been interested in their study from a botanical point of view, and it seems to him worth while to call the attention of those whom this report is likely to reach to some of the facts in regard to them.

Mushrooms are not only palatable but many are to be considered as delicacies. Mushrooms are nutritious, being comparable in this respect to the meats. Mushrooms at certain seasons are very abundant. In spite of these facts comparatively few people in this country make use of the wild species for food. This is undoubtedly due to the fact that it is known that some varieties are exceedingly poisonous. Therefore, those who do not know anything about the different kinds do well to let them all alone. There is, however, no good reason why persons who will take a little pains to become acquainted with these plants should not be able to avoid the dangerous ones and to enjoy the edible ones. It is the object of this paper to call attention to the poisonous ones, rather than to point out the harmless ones. For the former are comparatively few, and being once known so as to be avoided a great part of the danger of mushroom eating is removed.

According to popular belief, mushrooms are edible and toadstools are poisonous; the botanist calls them all mushrooms, but recognizes the fact that some are poisonous and others are not, just as is the case with higher plants. Mushrooms belong to that great class of plants known as fungi, which differ from ordinary plants in their shape, color, and mode of life. They consist of a vegetative part and a re-

productive part. The vegetative part is usually inconspicuous and simple in structure, consisting of a mold-like mass of minute colorless threads known as the mycelium, which grows on decomposing vegetable matter on the surface of the soil or on dead trees. The reproductive part is by far the largest and most conspicuous part, and is what is commonly called the mushroom. It assumes various forms, the most common of which is the familiar umbrella shaped structure consisting of a *stem*, and an expanded portion called the *pileus* or *cap*. The under side of the cap is covered either with thin radiating plates called *gills*, or with minute closely packed tubes or *pores*. On the surfaces of the gills or in the cavity of the pores the reproductive bodies or *spores* are borne. In some species in the young state the gills or pores are covered by a membrane known as the *veil*. As the mushroom develops this becomes detached from the circumference of the cap and may either fall off or remain attached to the stalk, when it is known as the *ring*. In some species, when very young, the whole mushroom is inclosed in a membrane called the *volva*; this is soon torn apart but traces of it may remain even in the mature state as wart-like projections on the cap or as a cup-like structure on the base of the stem, out of which the stem grows as from a socket. This cup is a mark of the highest importance in distinguishing the dangerous varieties. Poisonous mushrooms may be divided into two classes: those which are deadly and those which only produce nausea or some other digestive disturbance, but are not usually fatal. It is believed by authorities that all of the deadly varieties show the cup in some form at the base of the stem. If, therefore, one becomes familiar with its appearance, and is able to detect it, he will be able to avoid the chief dangers of poisoning.

At least two of the deadly varieties are common in New Hampshire. They both usually grow either in the woods or at the border of woods or thickets. One is almost pure white, with a smooth cap, or possibly warty when young, and certainly presents a most innocent appearance; but at the base

Fig. 5.— Fly Agaric. Poisonous.

of the stem, usually concealed in the decaying vegetable matter in which it grows, is to be found the well marked cup which is the sign of warning which must not be disregarded; it is deadly poison. Here is to be noted a precaution which should never be neglected in collecting mushrooms for eating purposes: *Never break off* the mushroom, but, so to speak, dig it up by the root; for only by so doing can one be certain that there is not a warning cup at the bottom of the stem.

One of the largest, handsomest, and in the latter part of the summer and fall, one of the commonest mushrooms is the *Agaricus muscarius* or "fly agaric," so called from its sometime use as a fly poison. It varies greatly in size and color; the stem is from three to seven inches in length; the cap has about the same range of diameter. The upper surface of the cap varies in color from almost white through yellow to orange or scarlet; it is studded more or less thickly with warty scales of a light color, the remnants of the volva. The gills are white, as is also the stem. The cup is present, but usually it is not so distinct as in the above-mentioned species. The lower part of the stem is more or less swollen or bulbous, the upper part of the bulbous portion being covered by a ragged surface sometimes showing a well marked ring corresponding to the margin of the cup, sometimes showing several rings, perhaps incomplete, one above the other. This mushroom is also deadly poison. Figures 4 and 5 show specimens. Figure 6 shows three young specimens which have but just broken out of the volva, the remains of which are seen on the unexpanded cap and on the bulbous base of the stem.

All mushrooms with a cup or the suspicion of a cup should be rejected.

None of the others are considered dangerous to life, although they may produce unpleasant symptoms. The possession of harmful properties is usually accompanied by a bitter, acrid, peppery, or otherwise unpleasant taste; all such should be rejected. If the mushroom is without a cup it should be tasted; if it is tender and pleasant to the taste the probability

is that it is not poisonous. Mushrooms should be gathered and eaten when fresh, as they soon become infested with insects and begin to decay.

In testing the edible properties of an unfamiliar species it is well to begin with a small portion, gradually increasing the amount if no unpleasant symptoms follow the first trials.

Dr. W. G. Farlow, in Bulletin 15, United States Department of Agriculture, gives the following rules:

"1. Avoid fungi in the button or unexpanded stage; also, those in which the flesh has begun to decay, even if only slightly. 2. Avoid all fungi which have stalks with a swollen base surrounded by a sac-like or scaly envelop, especially if the gills are white. 3. Avoid fungi having a milky juice, unless the milk is reddish. 4. Avoid fungi in which the cap or pileus is thin in proportion to the gills, and in which the gills are nearly all of equal length, especially if the pileus is bright colored. 5. Avoid all tube-bearing fungi in which the flesh changes color when cut or broken, or where the mouths of the tubes are reddish, and in the case of other tube-bearing fungi experiment with caution. 6. Fungi which have a sort of spider-web or flocculent ring around the upper part of the stalk should in general be avoided."

H. H. Lamson,
Bacteriologist.

DEPARTMENT OF ENTOMOLOGY.

During the past year the work of the department of entomology has consisted of studies of the life histories of various injurious insects and the methods of controlling them, of an investigation of the food relations of certain birds, especially the chickadee and the chipping sparrow, and of experiments with various insecticides. In addition the formation of a collection of New Hampshire insects has been continued, and the inquiries of many correspondents have been answered. The more important entomological events of the year are mentioned in the following Insect Record, although we have studied several insects not there included. In nearly

Fig. 6.—Fly Agaric, young. Poisonous.

all this work efficient aid has been rendered by Mr. W. F. Fiske, assistant entomologist.

The Insect Record for 1898.

Much the most important item in the record of insect injury for the year in New Hampshire is that of an exceedingly destructive outbreak of the FOREST TENT CATERPILLAR (*Clisiocampa disstria*), which extended over a large part of the state. This was a continuance of the irruption of this insect noted in the insect record for 1897,* although as was to be expected the outbreak this year was more serious and extended over a wider area. The caterpillars were most abundant in the western part of the state, especially in the Connecticut valley, where extensive forest areas were defoliated by them. For, unlike the common AMERICAN TENT CATERPILLAR (*Clisiocampa americana*), this forest species does not as a rule confine its attack to three or four sorts of trees, but feeds upon the foliage of nearly all deciduous species. The nearly full grown caterpillar is represented in Fig. 7. As will be seen by comparing this picture with Fig. 8, which represents the American Tent Caterpillar, the two species are similar; but they may easily be distinguished by the differences in the markings of the line along the middle of the back. In the forest caterpillars this line is interrupted, consisting of a series of markings like that shown in the middle of Fig. 7 *a*, while in the common tent caterpillar the line along the middle of the back is continuous.

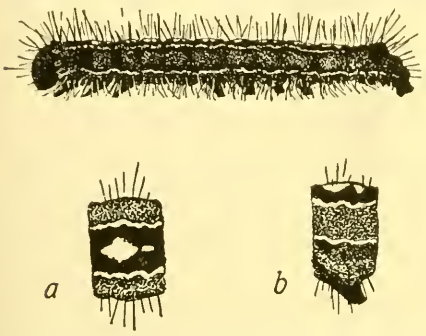


Fig. 7.—The Forest Tent Caterpillar : *a*, markings on one ring of the back; *b*, markings on one ring of the side.

These caterpillars have attacked nearly all kinds of deciduous trees, causing special damage to shade trees like the elm

* Bulletin 48, p. 142.

and maple. Many sugar orchards appear to have sustained injury that will lessen their productiveness in the immediate future. As a rule, the attack appears to have been more severe in the towns and villages than in the country. These larvæ hatch from the eggs a week or more later than the common American tent caterpillars, and there is considerable variation in the time of hatching within the species itself. In a given region caterpillars of various sizes could easily be found late in May or early in June. They feed upon the leaves in all parts of the trees, having a preference apparently for the upper branches. They very commonly eat out the blade of the leaf along the side of the midrib, severing the marginal part so that it falls off; these severed portions were to be found abundantly on the ground beneath the infested trees. The result of this peculiar mode of attack is of course greatly to increase the damage done for the amount of leafage actually consumed. A bulletin giving a full discussion of the life history and remedies for the forest tent caterpillar, is in preparation for publication before next spring.

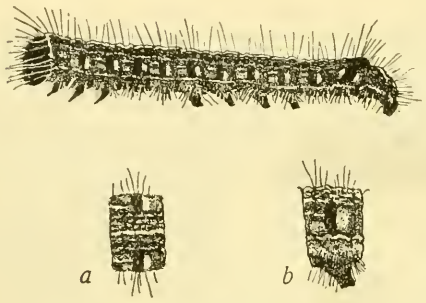


Fig. 8.— The American Tent Caterpillar : *a*, markings on one ring of the back; *b*, markings on one ring of the side.

A more encouraging statement may be made concerning the AMERICAN TENT CATERPILLAR (*Clisiocampa americana*), which have been regularly destructive for several seasons past, for in some localities at least there are indications that they will be less abundant next year. In the region about Durham there were heavy and long continued rains during the time when the caterpillars were hatching from the eggs and before they had time to spin for themselves a protecting web. The result was that a large proportion of the young larvæ

Fig. 11.—American Tent Caterpillars killed by disease.

were washed away or destroyed. As a rule only those survived which were able to shelter themselves on the under surface of the twig to which the egg mass was attached. Consequently, at the beginning of the season there was a considerable reduction in the numbers of the caterpillars. The survivors, however, developed in sufficient abundance to be decidedly in evidence in May, but during the last weeks of their growth there appeared among them a bacterial disease, a sort of insect cholera, which killed them in vast numbers. The effectiveness of this disease was doubtless increased by the wet weather prevailing at the time. Early in June nearly every nest was full of the dead and dying caterpillars, those upon the outside of the web hanging limp and lifeless at first (Fig. 11), and then gradually shriveling up until only the dried skins told of their presence. A series of observations made upon a large number of nests just before the period for pupation showed that more than ninety per cent of the caterpillars present had been killed by this disease. As a result there were few caterpillars crawling along the roads in early June, although during previous seasons great numbers were to be seen at that time. There were also comparatively few moths to be found later, and the egg masses of the next year's brood are correspondingly reduced in numbers, although there are still enough of these eggs

Fig. 9.— Leaf of Black Cherry eaten by Forest Tent Caterpillar.

upon the trees to yield a goodly crop of caterpillars next season.

We tried many experiments with remedies for the American Tent Caterpillar, although but little new information was brought out. The careful use of a small amount of kerosene, a teaspoonful to a nest, in wetting the silk of the tent, was found a satisfactory way of killing the partially grown caterpillars. But great care is necessary, as, if sufficient kerosene is added to saturate the bark, the tree is injured. If the web away from the bark is lightly dampened the caterpillars come in contact with it as they pass in and out of the nest and are killed.

Fig. 10.—Egg-mass of American Tent Caterpillar.

One of the most satisfactory remedial measures for these tent caterpillars that has come to my notice related to the removal of the egg masses. In Newfields, N. H., the Village Improvement Society offered the children in the schools ten cents a hundred for all the egg masses or "caterpillar belts," as they were aptly called, brought in. Many of the children worked faithfully, and when, in February, the writer was called in to point the moral of the lesson, 8,250 egg masses were shown as the result of their endeavors. I doubt if the expenditure of $8.25 by a village improvement society often does more good than was done in this case. The caterpillars were destroyed, the effect being easily noticeable in the spring and early summer, while the boys and girls had a remarkable lesson in nature study.

Several complaints reached the station during the summer concerning black spiny caterpillars that fed in colonies on the elm trees, often defoliating good sized branches. Whenever specimens accompanied the complaint, the insect proved to be the larvæ or caterpillars of the ANTIOPA BUTTERFLY (*Euvanessa antiopa*), a species which is more or less abundant every season. These butterflies are justly regarded as among the

Fig. 12.— Elm twig showing work of Antiopa Caterpillars.

most beautiful of our insects; the wings are a rich, purplish black color with a creamy yellow border running along the outer margin. They may be found late in autumn or early in spring flying by the roadside or in open glades in the woods; and occasionally during the intervening months one who looks beneath culverts or bridges, or in some loose pile of boards, will come across one of these butterflies passing the winter in a situation where it is exposed to the lowest temperatures. If in cold weather such a butterfly be brought into a warm room it will gradually become active. In spring eggs are laid by the females in clusters upon the twigs of elm, willow, and poplar trees, the eggs soon hatching into caterpillars that feed upon the foliage. The caterpillars remain together more or less as a colony, so that their presence is soon indicated by the bare twigs that they leave behind them. When they become full grown, they seek shelter of some sort, where each changes to a chrysalis, to emerge soon afterward as a fully developed butterfly. There are two broods each season.

These colonies of caterpillars are usually so conspicuous that it is an easy matter to cut off the branch on which they are feeding, and to crush them. Some of the caterpillars, the defoliated twig, and the slight silken web they make while they are at work are represented in Fig. 12.

Another insect attacking fruit and shade trees, which was extraordinarily abundant this year, was the FALL WEB WORM (*Hyphantria cunea*). The unsightly webs of these caterpillars, during the late summer and early autumn, festooned a large proportion of the orchard trees in southern New Hampshire. To many young trees these caterpillars must have caused serious injury. In another place* I have summarized the life history of this species, as follows:—The adult is a pretty white moth which deposits eggs on the leaves of various trees early in summer. These soon hatch into young caterpillars that begin at once to spin a protective web. The young worms are of a pale yellow color, sparsely clothed with hairs, and have a black head and two rows of black marks

* Insects and Insecticides, p. 201.

upon the body. They feed upon the parenchyma of the foliage, leaving the network of veins, and grow quite rapidly, enlarging the web as they develop. By the time they are full grown a single colony of them will destroy the foliage of a good sized branch, making it very conspicuous on account of the web-like covering. At this time the larvæ are a little more than an inch long, with the body densely clothed with yellowish hairs. They now leave their nests and descend to the ground, where just beneath the surface, or under some suitable shelter above the surface they spin slight silken cocoons, within which they change to the chrysalis state. At the north there is but one brood each year, but in the southern states there are two.

The webs of this insect are so conspicuous that it is an easy matter to cut them off and burn or crush the larvæ. This is a simple remedy, and the earlier that it is done the better. A little careful work in removing these webs when they first appear early in August will greatly improve the looks of the orchard, as well as increase its productiveness in following seasons. The caterpillars are then clustered together on one or two twigs, and may readily be crushed or burned.

Early in September there appeared in the vicinity of Durham an incipient outbreak of an insect that may be called the RED-HUMPED OAK CATERPILLAR, as it has not heretofore received a common name. In entomological literature it has generally been known by its scientific name, *Edema albifrons*,* although it has been so rarely destructive that the necessity for a common name has not been recognized. When full grown this caterpillar is nearly two inches long, and of the general form represented in *a* of Plate I; the head is reddish brown, while the body is striped longitudinally with black, yellow, and whitish. Near the hind end there is a prominent reddish hump, the presence of which has led to the proposal of the common name mentioned above.

These caterpillars feed upon the leaves of the various spe-

*This species has lately been placed in the genus *Symmerista*, and technically it is now called *Symmerista albifrons*.

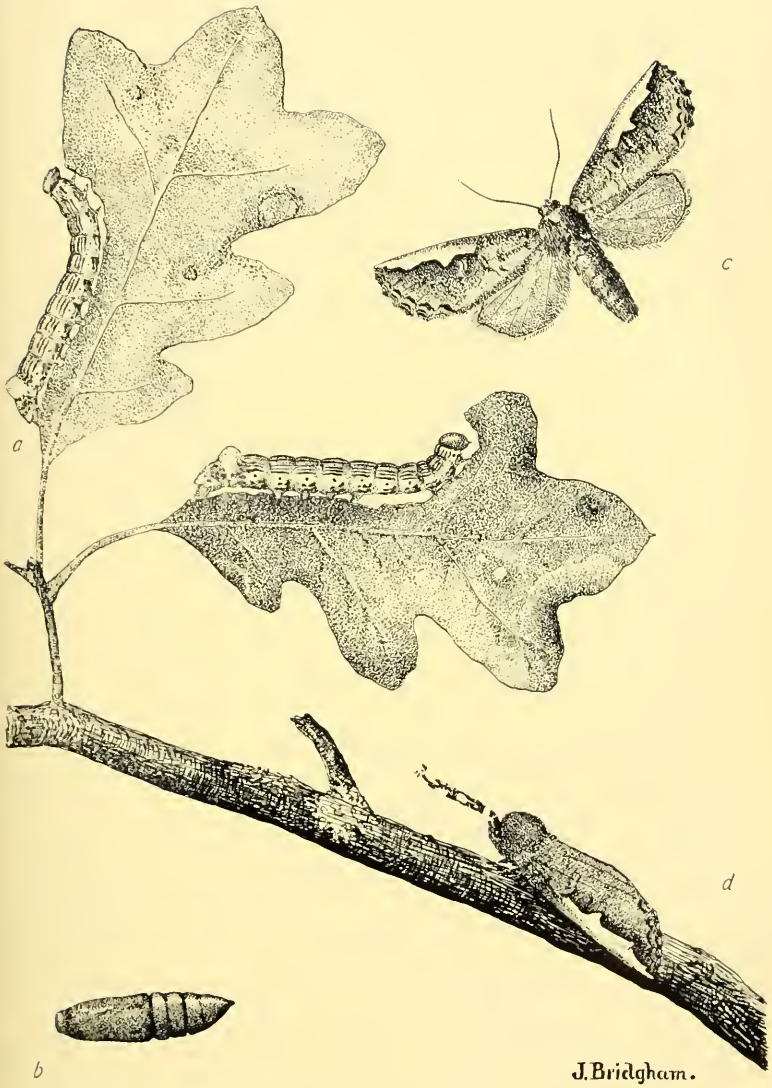


Plate I.—The Red-humped Oak Caterpillar: *a*, larva; *b*, pupa; *c*, moth, wings expanded; *d*, moth at rest.

cies of oak, eating the blades and leaving the midribs. In this process good sized pieces of the leaves are commonly detached to fall to the ground, where they were very abundant in the infested woods. When the caterpillars become full grown—from the middle to the last of September—they descend to the ground, where beneath the fallen leaves they pupate in a slight cocoon. The pupa is brown, and of the shape represented in Fig. *b* of the plate. The following spring the pupæ develop into greyish moths, similar to the one represented in *c*. These moths rest during the day upon oak twigs, being rendered inconspicuous by their resemblance to a growth on the twig.

These red-humped oak caterpillars are seldom injurious. One reason for this is to be found in the fact that they are greedily devoured by the common ruffed grouse or partridge, which frequents the open woods where the caterpillars occur. In a study of the food of this bird the present season, Mr. Ned Dearborn of this college has found that a large part of the food in September consisted of these caterpillars, as many as sixteen of them being found in a single stomach.

During the early summer inquiry was repeatedly made concerning two of our largest and most beautiful moths, which seemed either to be unusually abundant, or else to attract more than ordinary attention. The first of these is the large dark brown moth, the side view of which is represented in Fig. 13. When its wings are spread they commonly expand about five inches from tip to tip, the body of the insect being nearly an inch and a half long. On the front end of the body are two large feathery feelers or antennæ. On each of the wings near the middle there is a whitish or brownish crescent-like spot, while a wavy line, similar in coloration, runs along each wing nearly parallel with the outer margin and about three fourths of an inch from it. Near the tip of each front wing there is an oval black spot with a small white crescent on its inner edge. The body is of a brick red color, with rings of white and dark brown on each segment of the abdomen.

This moth, which is called the CECROPIA MOTH, being known to science as *Samia cecropia*, emerges from a large silken cocoon, like that shown in Fig. 13. These cocoons may be found in winter upon a variety of trees and shrubs; if brought in doors and kept in a cool room, they will yield the moth in the early summer. When at liberty these moths deposit their eggs on many sorts of fruit, forest, and shade trees, the eggs hatching into caterpillars that feed upon the foliage of the tree. The caterpillars grow during the summer, and early in autumn spin the large loose silken cocoons, within which they change to pupæ to remain throughout the winter. In New England this species is seldom if ever sufficiently abundant to do serious injury.

The other moth referred to above may fairly claim to be our most beautiful insect. By the great Linnæus it was named the LUNA (*Actias luna*), and has long been known as the Queen of the Night. Its general appearance is well shown in the photograph reproduced in Fig. 14, the wings expanding fully four inches, and the colors being a delicate green margined with greenish yellow along the posterior edges, and a delicate purplish brown along the front border. This species also appears in early summer, occasionally flying at night into open windows of lighted rooms, where its size and beauty are sure to attract attention. Its life history is quite similar to that of the Cecropia moth. Its eggs are deposited on the leaves of various trees; the caterpillars feed upon the foliage, and late in summer or early in autumn spin their tough, oval, silken cocoons on the ground beneath their host plant. There they remain until the warmth of the succeeding spring calls them to life, when they come from the cocoons as marvels of insect beauty. The caterpillars are seldom seen, and in New England at least they are never destructive to a serious extent.

The ROSE BEETLE (*Macrodactylus subspinosus*), or ROSE CHAFER, appeared in June, though in numbers conspicuously less than usual. On the college grounds the attack of this insect was most severe upon the young hydrangea shrubs, the

Fig. 13.—The Cecropia Moth and its Cocoon (Reduced).

leaves of which were eagerly devoured by the beetles, leaving only a framework of veins. (Fig. 15.) A number of substances were applied to check the injuries of the pests, but nothing was found so simple and effective as that of brushing them into a pail or pan holding a little water, on the surface of which is a little kerosene. This is to be done in the cooler part of the day when the beetles are more sluggish than in the warmer hours.

Fig. 15.— Leaf of Hydrangea eaten by Rose Beetles.

Several inquiries have been received during the year regarding a safe and effective remedy for the CABBAGE WORM (*Pieris rapæ*), which the present season has been at least as destructive as usual. In some parts of the country the practice of applying Paris green or other arsenical poisons to young cabbages has apparently been on the increase, the method having received the endorsement of a number of entomologists. It has been argued that there is no danger to the consumer because the amount of poison applied is so small, and as it is to be put on only when the plants are young before they have begun to head, the leaves to which it is applied will not be eaten. There is little doubt that the argument is sound, were it certain that the poison would only be applied under the conditions recommended. But the work must so often fall into the hands of ignorant and unskilled laborers, that the element of danger cannot be ignored. The first positive evidence of the danger that I have seen came to me in a letter from a correspondent at Hill, New Hampshire, who reported that he had known a case in which the members of a family had been made ill by eating cabbages that had been treated with Paris green.

We tried a large number of experiments with pyrethrum or insect powder as a remedy for the cabbage worm. This is one of the most important of the non-poisonous insecticides, killing caterpillars and other insects by merely coming in contact with their bodies. It was found to be effective when applied dry by means of a bellows, either undiluted, or thoroughly mixed with an equal quantity of flour. It also kills the worm when applied as a decoction made by adding one ounce of pyrethrum to one gallon of boiling water. Much less pyrethrum was required for a given area when it was put on in this way, than when it was used as a dry powder. The decoction is to be applied as a spray, either by means of an atomizing bellows, or a pump and spray nozzle. We also found that a one per cent solution of the Rose Leaf insecticide, a tobacco extract made by the Louisville Tobacco Company effectually kills the worms at a small expense.

The various stages in the life history of this cabbage worm are illustrated in Plate II. The adult insect is the common white butterfly, the male of which is shown at *c*, and the female at *d* of the plate. The latter deposits, singly, or in clusters of two or three each, small yellow eggs upon the cabbage leaves; these soon hatch into little green larvæ that feed upon the substance of the foliage. In about two weeks they become full grown, when they generally leave the cabbage plants, and finding some suitable shelter—beneath a board or under a coping of a fence,—change to chrysalids. They remain in this condition about ten days, when they emerge as butterflies, to lay eggs for another brood of worms. The winter is passed in the chrysalis state. There are several generations of larvæ each season, the number varying with the season and latitude.

During the spring numerous complaints were received regarding the injuries of the BEAN-WEEVIL (*Bruchus obtectus*), which appear to have been unusually severe. The presence of this insect is indicated by the small excavations which the larvæ make in the beans similar to those shown in Fig. 16 *c*. The fully developed weevil considerably magnified is repre-

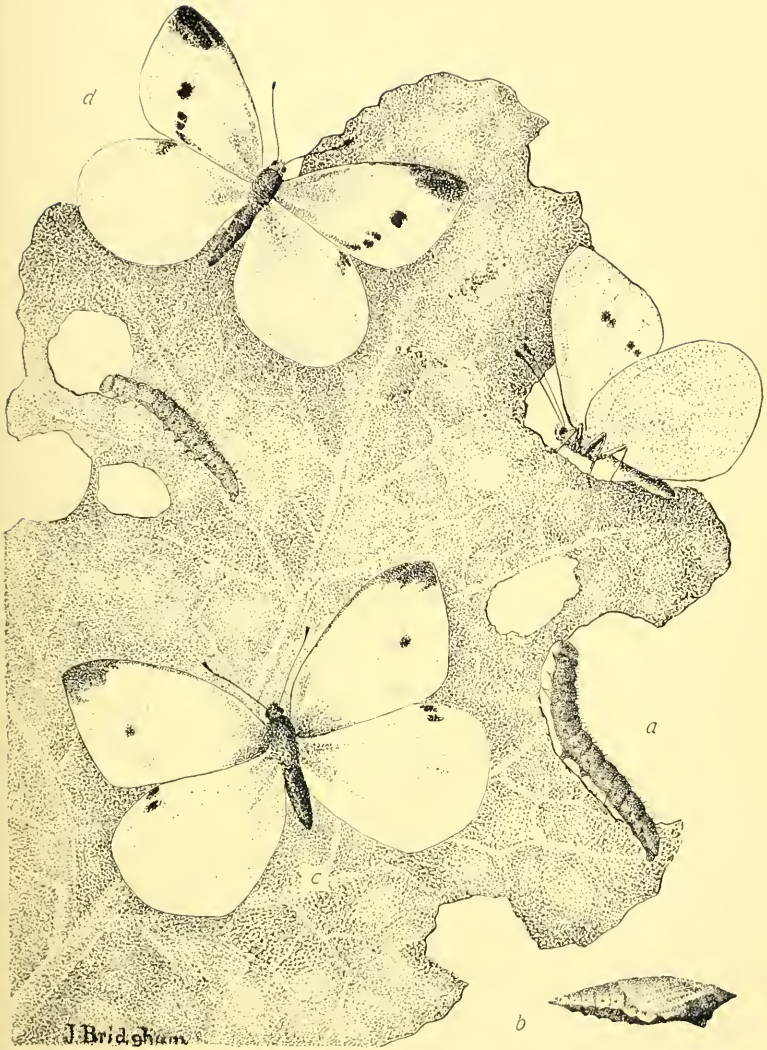


Plate II.—The Cabbage Butterfly: *a*, larva; *b*, chrysalis; *c*, male butterfly; *d*, female butterfly.

sented at *b* of the same figure, its natural size being indicated at *a*. In the field these weevils deposit eggs inside the green pods in small clusters. In a short time the eggs hatch into tiny grubs that feed within the beans, maturing in about a month. These insects are also able to develop in dried beans, so that when they are present in beans put away in autumn, many more may be present the following season. The best way of preventing such a continuance of their injury seems to be to inclose the infested beans in a tight vessel in which a little bisulphide of carbon, benzine, or gasoline has been placed. The fumes of these volatile substances will destroy the beetles. Of course care must be taken that no fire comes in the vicinity of the treatment.

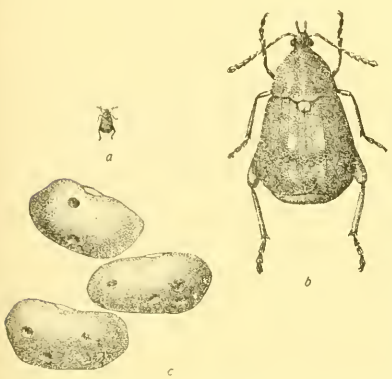


Fig. 16.—The Bean-Weevil: *a*, natural size; *b*, enlarged; *c*, beans from which beetle has escaped.

In the bulletin on the Canker Worm (No. 44) attention was called to the value of a substance called Raupenleim as a substitute for printer's ink in banding orchard trees. Letters received during the present year have shown that this substitute has been used with a great saving of the expense involved in the use of ink. The Raupenleim has been used in large quantities by the Gypsy Moth committee in Massachusetts. During a recent conversation with these officials I learned that there is sometimes danger in applying this substance to young and smooth barked trees, from the material penetrating the inner bark and killing the growing cells. Consequently I would recommend, that in the case of young trees as well as those older which have a smooth bark that if Raupenleim be applied it be placed on strips of thick paper tacked to the trees. Even in the case of bearing apple trees

this would probably be the safer method, and it should always be adopted for peach trees, if not for pear trees also. After the Raupenleim has been on some weeks the surface hardens into a crust, and it is advisable to scrape off this crust after the danger from canker worms is past. Too much of the rough bark should not be scraped off of the older trees to which the band of Raupenleim is to be applied, unless paper is to be used.

Less than the usual amount of injury was done this season by the apple worm, the larvæ of the CODLING MOTH (*Carpocapsa pomonella*). This immunity was probably due in part at least to the small apple crop of the last year. There has also been but little complaint regarding the APPLE MAGGOT (*Trypeta pomonella*), or Railroad Worm. The SQUASH BUG (*Anasa tristis*), STRIPED CUCUMBER BEETLE (*Diabrotica vittata*), and various flea beetles have been about as destructive as usual, while the SUGAR MAPLE BORER (*Glycobius speciosus*), treated of in Bulletin No. 33 of this station, is continuing its destructive work in many parts of the state. Little injury, however, has been done by the WHITE MARKED TUSSOCK MOTH (*Orgyia leucostigma*) discussed in the same bulletin. The PEAR SLUG (*Eriocampoides limacina*) was somewhat destructive in the southern part of the state. The HORN FLY (*Haematobia serrata*), or Texas fly, has been reported as very troublesome at Franklin Falls.

CLARENCE M. WEED,
Entomologist.

DEPARTMENT OF METEOROLOGY AND AGRICULTURAL ENGINEERING.

1897-'98.

I. METEOROLOGY.

Observations have been continued the past year as heretofore under the charge of James A. Foord, New Hampshire College, class of '98, who has been assisted for a portion of the year by William F. Fiske, special student in biology.

Fig. 14.—The Luna Moth (Slightly Reduced).

Signal flags have been displayed each day, except Sundays, throughout the year from the tower of the experiment station building, indicative of the weather for the succeeding night and day. In addition, a synopsis of weather conditions has been written each day upon the blackboard at the station building for the benefit of the station workers.

Another year has been characterized by a large precipitation, and it is like the last in having this precipitation quite uniformly distributed throughout the year. There has been no suspicion of drought, and the soil has been moist continuously. The least number of rainy days in any month was five, the same as for the year preceding. The total rainfall was seven inches less than for the previous year, chiefly because of the absence of such remarkable storms as those of September 6, 1896, and June 10, 1897. The mean temperature of the summer months of 1897 was about normal, but there was a notable lack of extremes. Only one hot spell occurred in July, not one in August, and one in September. No one was of great length or of excessive severity. July was the wettest month of the year, judged by its total rainfall. In both July and August the weather was very catchy, so that it was almost impossible to cure hay seasonably or well. It was frequently remarked that nothing like it was remembered by the oldest inhabitant. The result was a large crop of very poor quality of hay. Other crops were backward, but the long season helped them out so that a fair harvest was reaped. No killing frost occurred till near the close of September.

October averaged warm, owing chiefly to warm days indicated by an unusually high mean maximum. It was the driest month of the year, with only one half inch of rainfall and five rainy days.

November has some claim to be considered the wettest month as it stands first in number of rainy days, and second in total precipitation. It was as much colder than the average as October was warmer, contrary to expectations based on difference in rainfall. The last week was unusually cold for the season.

December temperature was medium warm. No snow of any amount came to stay till the last day of the month. Upon the sixteenth all frost came out of the ground, and the unseasonable spectacle was presented of numerous people plowing upon December 17.

January was a normal month in all respects. Three cold spells were noted, but they were all, with possibly one exception, of a mild order. Sleighing was continuous through this as well as the following month.

February came in with a driving snowstorm, that came near being a record breaker. Not even an engine passed this railroad station for twenty-four hours, and on the second day trains were one to three hours late. It was more the fury of the wind than the amount of snow that caused the total stoppage of traffic. The precipitation and temperature for the month were medium. Only one sustained cold spell occurred and this was not excessive.

March was unseasonably warm with a small precipitation, while opposite conditions prevailed in April, thus showing a second time in one year unexpected monthly combinations of high temperature with small precipitation and the reverse.

May was a wet month with fourteen rainy days. The old saying, "A wet May for hay," proved a true prophecy.

The precipitation for June was also abundant though not excessive, and the making of a large hay crop was thus assured. Other crops were backward on account of the wet spring, but on the whole made a good growth.

The detailed record of observations taken, together with a summary of the same, will be found appended.

II. Agricultural Engineering.

Progress has been made during the year in extending the bounds along the highway in front of college property. Stone posts have been set and located where necessary between the corner of the President's lot, next to Professor Rane's house, and the Louisa Smith lot on Main street; also, upon Madbury street as far as the Silas Jenkins lot, except that the location

of the north line of the dormitory lot next to the Louisa Smith lot has not yet been fully adjusted.

The steam drill belonging to the college was employed late in the fall of 1897 to complete the excavation of stone in the field west of the railroad station. The stone, however, were not moved away till spring, a derrick being then set up to assist in the work.

Experiments in road surfacing of quite extensive character were carried on during the spring of 1898, the details and results of which will appear in due time in bulletin form.

Class instruction was carried on in connection with the use of the steam drill, the derrick, and different materials

Road conventions at Keene, N. H., and Vergennes, Vt., have been attended during the year, and numerous talks upon road construction given at other places.

C. H. Pettee,
Meteorologist.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8' N.

July, 1897.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	71.	29.758	78.	29.772	65.	71.	68.	81.	49.	65.	32.
2	75.	29.794	75.	29 852	71.	65.	68.	78.	52.	67.	26.
3	71.	29.998	67.	30.134	57.	61.	69.	72.	56.	64.	16.
4	70.	30.220	73.	30.074	64.	62.	63.	73.	50.	61.2	23.
5	76.	30.030	87.	29.978	75.	77.	76.	95.	60.	77.5	35.
6	85.	30.054	85.	30.068	78.	74.	76.	87.	70.	78.5	17.
7	80.	30.116	84.	30.132	74.	74.	74.	85.	65.	75.	20.
8	84.	30.170	86.	30.012	79.	76.	77.5	92.	65.	78.5	27.
9	85.	29.926	91.	29.700	82.	82.	82.	96.	67.	81.5	29.
10	75.	29.986	74.	30.012	62.	60.	61.	71.	60.	65.5	11.
11	72.	29.888	78.	29.750	62.	66.	64.	75.	58.	66.5	17.
12	81.	29.770	79.	29.746	72.	78.	75.	85.	64.	74.5	21.
13	76.	29.770	79.	29.844	74.	75.	74.5	83.	68.	75.5	15.
14	74.	29.768	75.	29 900	69.	69.	69.	75.	61.	69.	16.
15	75.	30.014	84.	30.005	75.	72.	73.5	84.	69.	76.5	15.
16	75.	30.172	84.	30.142	78.	75.	76.5	88.	58.	73.	30.
17	75.	30.176	80.	30.190	75.	72.	73.5	85.	60.	72.5	25.
18	75.	30.232	75.	30.358	75.	67.	71.	79.	64.	71.5	15.
19	75.	30.382	71.	30.296	69.	65.	67.	75.	60.	67.5	15.
20	78.	30.226	75.	30.168	68.	67.	67.5	81.	63.	72.	18.
21	74.	30.125	81.	30.072	75.	73.	74.	82.	64.	73.	18.
22	77.	30.008	75.	29.828	73.	67.	70.	75.	67.	71.	8.
23	79.	29.826	85.	29.700	74.	74.	74.	85.	56.	70.5	29.
24	75.	29.612	75.	29.645	70.	67.	68.5	75.	63.	69.	12.
25	74.	29.750	75.	29.988	66.	64.	65.	75.	60.	67.5	15.
26	67.	30.058	67.	30.092	63.	57.	60.	72.	57.	64.5	15.
27	67.	30.118	68.	30.100	62.	59.	60.5	67.	47.	57.	20.
28	66.	30.054	68.	30.085	60.	56.	58.	64	55.	59.5	9.
29	65.	29.914	68.	29.866	58.	60.	59.	61.	56.	58.5	5.
30	66.	29.865	75.	29.908	65.	68.	66.5	77.	59.	68.	18.
31	73.	29.875	76.	29.844	70.	65.	67.5	84.	59.	71.5	25.
Sum...	.....	.....	.....	.....	2160.	2118.		2457.	1862.	.....	.....
Mean..	.....	.....	.....	.....	69.6+	68.3+		79.2+	60.+	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

July, 1897.	PRECIPITATION.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Total amount in inches.	Snowfall in inches.			
1	.....	.....	.....	.....	N. W.	Clear.	Maximum temperature, 96; date, 9th. Minimum temperature, 47; date, 27th. Mean temperature (mean max. + mean min. ÷ 2), 69.6. Mean temperature (8 + 8 ÷ 2), 68.9. Mean max. temperature, 79.2; mean min. temperature, 60. Total precipitation, 6.98 inches. Greatest precipitation in any 24 consecutive hours, 3.56; date, 13th. No. of clear days, 9; partly cloudy, 9; cloudy, 13; on which .01 or more precipitation fell, 9. Prevailing wind direction, E. Several thunder showers in p. m. July 12.
2	.....	.....	.....	.....	E.	Cloudy.	
3	.....	.....	.....	.....	E.	Cloudy.	
4	.....	.....	.....	.....	S. E.	Partly cloudy.	
5	.....	.....	.....	.....	S. E.	Partly cloudy.	
6	.....	.....	.....	.....	E.	Cloudy.	
7	.....	.....	.....	.....	E.	Clear.	
8	.....	.....	.....	.....	S. W.	Clear.	
9	.....	.....	.....	.....	W.	Clear.	
10	.....	.....	.....	.....	E.	Cloudy.	
11	.....	.....	.....	.....	S. E.	Partly cloudy.	
12	11.45 a. m.	.....	.....	.....	W.	Partly cloudy.	
13	.....	.....	3.56	.....	S.	Cloudy.	
14	.....	9 p. m.	.40	.....	S.	Cloudy.	
15	.....	.....	.....	.....	S. W.	Clear.	
16	.....	.....	.....	.....	S.	Clear.	
17	.....	.....	.....	.....	S. W.	Cloudy.	
18	.....	.....	.....	.....	S. E.	Cloudy.	
19	.....	.....	.....	.....	E.	Clear.	
20	.....	.....	.....	.....	S. E.	Cloudy.	
21	12.30 p. m.	1 p. m.	*	.....	S.	Partly cloudy.	
22	10.30 a. m.	During night.	.44	.....	S. E.	Cloudy.	
23	2 p. m.	3 p. m.	.27	.....	S. W.	Partly cloudy.	
24	1.50 p. m.	4 p. m.	1.00	.....	W.	Clear.	
25	3.15 p. m.	During night.	.03	.....	S. E.	Cloudy.	
26	.....	.....	.....	.....	E.	Clear.	
27	.....	.....	.....	.....	E.	Partly cloudy.	
28	During night.	.....	.....	.....	E.	Cloudy.	
29	.....	4 p. m.	1.21	.....	N. E.	Cloudy.	
30	.....	.....	.....	.....	W.	Partly cloudy.	
31	Showers in p. m.		.07	.....	W.	Partly cloudy.	
Sum...	.....	.....	6.98				

* Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

August, 1897.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	72.	29.844	75.	29.932	68.	63.	65.5	77.	57.	67.	20.
2	71.	29.966	77.	30.050	69.	65.	67.	76.	57.	66.5	19.
3	74.	30.086	82.	39.050	72.	73.	72.5	85.	58.	71.5	27.
4	78.	30.076	78.	30.088	74.	67.	70.5	81·	63.	72.	18.
5	72.	30.118	75.	30.100	61.	63.	62.	75.	59.	67.	16.
6	73.	30.090	77.	30.076	70.	68.	69.	81.	55.	68.	26.
7	76.	30.162	77.	30.128	72.	68.	70.	82.	56.	69.	26.
8	75.	30.096	70.	30.072	69.	70.	69.5	86.	54.	70.	32.
9	75.	29.960	76.	29.962	69.	61.	65.	83.	60.	71.5	23.
10	72.	29.906	74.	29.878	67.	64.	65.5	72.	54.	63.	18.
11	70.	29.724	74.	29.694	64.	64.	64.	70.	60.	65.	10.
12	72.	29.632	73.	29.960	64.	63.	63.5	78.	61.	69.5	17.
13	71.	29.968	76.	29.964	65.	64.	66.5	74.	52.	63.	22.
14	74.	29.982	80.	29.998	67.	69.	68.	84.	58.	71.	26.
15	72.	29.960	80.	29.900	66.	70.	68.	81.	58.	69.5	23.
16	75.	29.816	78.	29.796	68.	66.	67.	81.	66.	73.5	15.
17	77.	29.688	78.	29.904	69.	64.	66.5	74.	61.	67.5	13.
18	73.	30.028	76.	30.146	63.	62.	62.5	77.	51.	64.	26.
19	74.	29.092	76.	29.928	66.	68.	67.	76.	57.	66.5	19.
20	72.	29.912	72.	30.040	66.	57.	61.5	73.	57.	65.	16.
21	70.	30.142	75.	30.066	60.	65.	62.5	76.	45.	60.5	31.
22	71.	29.972	72.	29.922	66.	62.	64.	79.	59.	69.	20.
23	68.	30.066	66.	30.134	57.	54.	55.5	64.	53.	58.5	11.
24	64.	29.926	63.	29.800	58.	54.	56.	59.	51.	55.	8.
25	62.	29.828	73.	29.848	60.	66.	63.	76.	51.	63.5	25.
26	70.	29.942	73.	29.942	66.	61.	63.5	75.	53.	64.	22.
27	65.	30.008	70.	29.882	60.	61.	60·5	74.	47.	60.5	27.
28	69.	29.852	76.	29.932	65.	68.	66.5	81.	58.	69.5	21.
29	71.	30.008	74.	29.974	64.	68.	66.	85.	56.	68.	24.
30	72.	29.862	74.	29.934	67.	63.	65.	77.	57.	67.	20.
31	68.	30.012	72.	30.061	62.	63.	62.5	76.	48.	62.	28.
Sum...	.....	.....	.....	.....	2034.	1994.	.....	2383.	1732.	.....	.....
Mean..	.....	.....	.....	.....	65.6+	64.3+	.....	76.8+	55.8+	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

August, 1897.	PRECIPITATION.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Amount in inches.	Snowfall in inches.			
1	Showers.		.33	.....	W.	Partly cloudy.	Maximum temperature, 86; date, 8th.
2	Shower at 12.30 p. m.	.....	.08	.....	W.	Partly cloudy.	
3	.....	.....	.....	.....	W.	Clear.	Minimum temperature, 45; date, 21st.
4	Shower at 5 p. m.; 9 p.m.	9 a. m.	.36	.....	E.	Partly cloudy.	Mean temperature, (mean max.+mean min. ÷2), 66.3.
5	.....	.....	.....	.....	W.	Partly cloudy.	
6	.....	.....	.....	.....	N. W.	Clear.	Mean temperature, (8+8÷2), 64.9.
7	.....	.....	.....	.....	N. W.	Clear.	
8	.....	.....	.....	.....	N. W.	Clear.	Mean max. temperature, 76.8; mean min. temperature, 55.8.
9	4.30 p. m.	6 p. m.	.15	....	S.W.	Partly cloudy.	
10	8.30 p. m.	During night.	.03	.....	S.W.	Partly cloudy.	
11	7.30 a. m.	During night.	.10	.....	E.	Cloudy.	Total precipitation, 2.97 inches.
12	.....	.....	.....	.....	W.	Clear.	Greatest precipitation in any 24 consecutive hours, .83; date, 24th.
13	.....	.....	.....	.....	W.	Clear.	
14	.....	.....	.....	.....	W.	Clear.	
15	7 p. m.	.....	.....	.....	S.	Cloudy.	
16	.....	During night.	.57	.....	S.	Cloudy.	Number of clear days, 15; partly cloudy, 12; cloudy, 4; on which .01 or more precipitation fell, 10.
17	.....	.....	.....	.....	S.W.	Clear.	
18	During night.		.11	.....	S.W.	Partly cloudy.	
19	.....	.....	.....	.....	N.W.	Partly cloudy.	
20	.....	.....	.....	.....	W.	Clear.	
21	.....	.....	.....	.....	W.	Clear.	Prevailing wind direction, W.
22	1.30 p. m.; 3 p. m.	During night.	.41	.....	W.	Partly cloudy.	
23	.....	.....	.....	.....	N. E.	Partly cloudy.	
24	6.30. a. m.	During night.	.83	.....	N. E.	Cloudy.	
25	.....	.....	.....	.....	W.	Partly cloudy.	
26	.....	.....	.....	.....	W.	Clear.	
27	.....	.....	.....	.....	W.	Clear.	
28	.....	.....	.....	.....	W.	Clear.	
29	.....	.....	.....	.....	S.W.	Clear.	
30	.....	.....	.....	.....	W.	Partly cloudy.	
31	.....	.....	.....	.....	W.	Clear.	
Sum...	.....	.....	2.97				

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

September, 1897.	8 A.M.		8 P.M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8. p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	72.	30.094	75.	30.062	61.	66.	63.5	79.	49.	64.	30.
2	69.	30.058	70.	30.056	61.	64.	62.5	71.	59.	65.	12.
3	66.	30.224	65.	30.282	59.	50.	59.5	71.	50.	60.5	21.
4	62.	30.360	66.	30.308	58.	55.	56.5	70.	46.	58.	24.
5	67.	30.218	69.	30.184	61.	71.	66.	84.	47.	65.5	37.
6	72.	30.112	75.	29.900	70.	74.	72.	87.	55.	71.	32.
7	69.	30.072	65.	29.990	62.	59.	60.5	68.	58	63.	10.
8	67.	29.952	75.	29.894	59.	65.	62.	77.	55.	66.	22.
9	75.	29.788	80.	29.752	75.	77.	76.	91.	54.	72.5	37.
10	79.	29.782	84.	29.706	78.	79.	78.5	95.	67.	81.	28.
11	81.	29.746	72.	29.888	80.	56.	68.	81.	56.	68.5	25.
12	68.	30.016	65.	29.928	56.	53.	54.5	66.	46.	56	20.
13	64.	29.722	71.	29.874	60.	65.	62.5	70.	49.	59.5	21.
14	67.	29.738	65.	29.896	61.	54.	57.5	67.	54.	60.5	13.
15	62.	29.958	66.	29.814	56.	56.	56.	71.	43.	57.	28.
16	63.	29.790	66.	29.606	58.	61.	59.5	76.	42.	58.	34.
17	66.	29.492	60.	29.596	59.	57	58.	67.	57.	62.	10.
18	60.	29.654	65.	29 676	49.	45.	47.	63.	39.	52.	24.
19	58.	29.662	64.	29.752	55.	54.	54.5	77.	35.	56.	42.
20	61.	29.652	64.	29.602	57.	54.	55.5	69.	45.	57.	24.
21	59.	29.704	57.	29.892	50.	39.	44.5	67.	39.	53.	28.
22	53.	29.994	57.	29.988	47.	50.	48.5	59.	33.	46.	26.
23	54.	29.972	68.	29.958	50.	53.	51.5	58.	45.	51.5	13.
24	57.	29.736	61.	29.680	53.	56.	54.5	58.	51.	54.5	7.
25	67.	29.738	70.	29.800	61.	59.	60.	75.	53.	64.	22.
26	59.	29.622	70.	29.938	58.	60.	59.	78.	48.	63.	30.
27	65.	29.796	55.	29.792	47.	45.	46.	55.	45.	50.	10.
28	56.	29.836	56.	29.866	44.	49.	46.5	59.	39.	49.	20.
29	55.	29.932	58.	29.996	51.	52.	51.5	63.	42.	52.5	21
30	59.	29.980	62.	29.986	48.	59.	53.5	74.	37.	55.5	37.
Sum...	.....	.....	.....	.....	1744.	1747.	.....	2146.	1438.	.....	.....
Mean..	.....	.....	.....	.....	58.1+	58.2+	.....	71.5+	47.9+	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

September, 1898.	PRECIPITATION.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Amount in inches.	Snowfall in inches.			
1	During night.	.....	.....	.....	S.	Clear.	Maximum temperature, 95; date, 10th.
2	.....	12 m.	.52	.....	S.W.	Partly cloudy.	
3	.....	.....	.....	.....	W.	Clear.	Minimum temperature, 33; date, 22d.
4	.....	.....	.....	.....	W.	Clear.	
5	.....	.....	.....	.....	W.	Clear.	Mean temperature (mean max. + mean min. ÷ 2), 59.7.
6	.....	.....	.....	.....	W.	Clear.	
7	.....	.....	.....	.....	S.	Cloudy.	
8	.....	.....	.....	.....	S.	Cloudy.	Mean temperature (8 + 8 ÷ 2), 58.2.
9	.....	.....	.....	.....	S.W.	Clear.	
10	.....	.....	.....	.....	S.W.	Clear.	Mean max. temperature, 71.5; mean min. temperature, 47.9.
11	1 p. m.	4 p. m.	.09	.....	N. W.	Cloudy.	
12	.....	.....	.....	.....	S.E.	Partly cloudy.	
13	Showers.		.52	.....	N. E.	Cloudy.	
14	.....	.....	.....	.....	N. W.	Clear.	Total precipitation, 2.71 inches.
15	.....	.....	.....	.....	N. W.	Clear.	
16	Showers.		.09	.....	E.	Partly cloudy.	Greatest precipitation in any 24 consecutive hours, .98; date, 20th.
17	.....	.....	.....	.....	W.	Cloudy.	
18	.....	.....	.....	.....	W.	Clear.	
19	.....	.....	.....	.....	W.	Clear.	
20	4 p. m.	During night.	.98	.....	N. E.	Cloudy.	Number of clear days, 15; partly cloudy, 5; cloudy, 10; on which .01 or more precipitation fell, 8.
21	.....	.....	.....	.....	N. W.	Clear.	
22	.....	.....	.....	.....	N.E.	Cloudy.	
23	8 p. m.	.....	.36	.....	N. E.	Cloudy.	
24	.....	8 p. m.	.06	.....	N.	Cloudy.	
25	.....	.....	.....	.....	W.	Partly cloudy.	Prevailing wind direction, W.
26	6.30 p. m.	7.30 p. m.	.09	.....	W.	Cloudy.	
27	.....	.....	.....	.....	N.W.	Clear.	Date of frost, light, 15th, 16th, 18th.
28	.....	.....	.....	.....	W.	Clear.	
29	.....	.....	.....	.....	W.	Clear.	Date of frost, killing, 22d.
30	.....	.....	.....	.....	N.W.	Partly cloudy.	
Sum...	.....	.....	2.71	.....	.....	.....	Thunder storm, 6.30 to 7.30 p. m. on 26th.
.....	.....	.....	.....	.....	.....	.....	

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

October, 1897.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	64.	29.726	65.	29.966	65.	60.	62.5	81.	50.	65.5	31.
2	62.	30.218	62.	29.982	48.	38.	43.	56.	38.	47.	18.
3	59.	30.316	60.	30.274	49.	44.	46.5	63.	31.	47.	32.
4	58.	30.121	65.	30·067	46.	53.	49.5	76.	30.	53.	46.
5	60.	29.912	65.	29.724	48.	56.	52.	78.	32.	55.	46.
6	62.	29.568	70.	29.578	50.	57.	53.5	73.	40.	56.5	33.
7	65.	29.606	65.	29.864	50.	53.	51.5	60.	42.	51.	18.
8	60.	29.778	65.	29.768	47.	45.	46.	60.	42.	51.	18.
9	58.	29.550	63.	29.866	52.	44.	48.	64.	41.	52.5	23.
10	55.	30.002	62.	29.942	38.	39.	38.5	56.	29.	42.5	27.
11	55.	29.924	70.	29.904	41.	59.	50.	59.	32.	45.5	27.
12	70.	29.744	70.	29.712	65.	64.	64.5	76.	55.	65.5	21.
13	70.	29.974	65.	30.174	59.	52.	55.5	65.	51.	58.	14.
14	62.	30.228	65.	30.076	46.	53.	49.5	64.	34.	49.	30.
15	63.	29.878	76.	29.770	56.	70.	63.	88.	48.	68.	40.
16	72.	29.676	80.	29.404	72.	77.	74.5	87.	62.	74.5	25.
17	62.	29.730	55.	29.978	46.	40.	43.	58.	40.	49.	18.
18	55.	30.080	65.	29.964	38.	48.	43.	63.	30.	46.5	33.
19	60.	29.808	60.	29.784	51.	44.	52.5	66.	38.	52.	28.
20	61.	29.874	70.	29.912	47.	45.	46.	54.	41.	47.5	13.
21	60.	29.762	65.	29.787	44.	44.	44.	49.	41.	45.	8.
22	58.	29 900	60.	29.980	38.	39.	38.5	47.	34.	40.5	13.
23	60.	30 080	65.	30.192	41.	36.	38.5	54.	29.	41.5	25.
24	56.	30.010	65.	29.922	35.	43.	39.	55.	25.	40.	30.
25	57.	29.734	60.	29.808	52.	47.	49.5	62.	41.	51.5	21.
26	57.	29.818	64.	29.892	47.	44.	45.5	61.	44.	52.5	17.
27	58.	29 938	62.	29.887	38.	43.	40 5	60.	32.	46.	28.
28	60.	29.708	65.	29.436	44.	53.	48.5	54.	37.	45.5	17.
29	59.	29.260	60.	29.424	50.	42.	46.	53.	42.	47.5	11.
30	55.	29 594	58.	29.793	32.	34.	33.	49.	26.	37.5	23.
31	50.	29.960	53.	29.972	30.	40.	35.	51.	23.	37.	28.
Sum					1465.	1516.		1942.	1180.		
Mean					47.2+	48.9+		62.6+	38.+		

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

October, 1897.	Precipitation.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Amount in inches.	Snowfall in inches.			
1					W.	Partly cloudy.	Maximum temperature, 88; date, 15th.
2					W.	Clear.	
3					W.	Clear.	Minimum temperature, 23; date, 31st.
4					S. W.	Clear.	
5					S. W.	Clear.	Mean temperature (mean max.+mean min.÷2), 50.3.
6					S. W.	Partly cloudy.	
7	During night.		*		N. W.	Partly cloudy.	
8	During night.		.03		W.	Partly cloudy.	Mean temperature (8+8÷2), 48.1.
9					N. W.	Clear.	
10					W.	Clear.	Mean max. temperature, 62.6; mean min. temperature, 38.
11	12.45 p. m.		.03		S. E.	Cloudy.	
12		During night.	.36		S. E.	Cloudy.	Total precipitation, .49 inches.
13					W.	Clear.	
14					N. W.	Partly cloudy.	Greatest precipitation in any 24 consecutive hours, .39; date, 11th.
15	1.30 p. m.	1.45 p. m.	.01		W.	Clear.	
16					W.	Clear.	
17					W.	Clear.	Number of clear days, 15; partly cloudy, 10; cloudy, 6; on which .01 or more precipitation fell, 5.
18					W.	Clear.	
19					N. W.	Partly cloudy.	
20					E.	Cloudy.	
21					N.	Cloudy.	
22					N. E.	Partly cloudy.	
23					N.	Clear.	
24						Cloudy.	
25					N. W.	Clear.	Prevailing wind direction, W.
26					W.	Clear.	
27					N. E.	Clear.	
28	2.30 p. m.	During night.	.06		S.	Cloudy.	
29					N. W.	Partly cloudy.	
30					W.	Partly cloudy.	
31					N. W.	Partly cloudy.	
Sum...			0.49				

* Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

November, 1887.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	49.	29.886	60.	29.682	40.	53.	46.5	53.	35.	44.	18.
2	57.	29.528	58.	29.504	51.	40.	45.5	51.	40.	45.5	11.
3	55.	29.378	59.	29.692	41.	45.	43.	55.	39.	47.	16.
4	54.	29.918	60.	29.914	40.	45.	42.5	60.	34.	47.	26.
5	52.	29.906	60.	29.824	37.	44.	40.5	48.	31.	39.5	17.
6	58.	29.542	64.	29.538	48.	45.	46.5	64.	43.	53.5	21.
7	52.	29 578	52.	29.668	43.	38.	40.5	45.	38.	41.5	7.
8	52.	29.608	60.	29.642	39.	42.	40.5	54.	35.	44.5	19.
9	55.	29.324	60.	28.792	40.	40.	40.	47.	38.	42.5	9.
10	50.	29.296	60.	29.626	37.	34.	35.5	45.	34.	39.5	11.
11	53.	29.680	62.	29.418	28.	38.	33.	40.	23.	31.5	17.
12	47.	28 920	55.	29.192	35.	40.	37.5	40.	32.	36.	8.
13	49.	29.316	50.	29.572	39.	34.	36.5	43.	32.	37.5	11.
14	42.	29 718	42.	29.862	32.	32.	32.	39.	27.	33.	12.
15	41.	29.976	50.	29.998	26.	39.	32.5	46.	21.	33.5	25.
16	53.	29.760	65.	29.562	43.	59.	51.	63.	36.	49.5	27.
17	56.	29.944	58.	30.002	32.	30.	31.	39.	30.	34.5	9.
18	51.	30.054	58.	30.084	24.	23.	23.5	33.	22.	27.5	11.
19	51.	30.020	50.	29.976	21.	25.	46.	28.	18.	23.	10.
20	59.	30.006	58.	29.970	22.	21.	21.5	33.	19.	26.	14.
21	53.	29.798	48.	29.444	32.	40.	36.	49.	28.	38.5	21.
22	52.	29.752	60.	29.792	31.	30.	30.5	37.	27.	32.	10.
23	58.	29.550	60.	29.760	25.	17.	21.	32.	17.	24.5	16.
24	57.	30.068	62.	30.124	12.	24.	18.	29.	9.	19.	20.
25	61.	30.092	53.	30.012	30.	38.	34.	40.	25.	32.5	15.
26	62.	29.862	71.	29.662	54.	62.	58.	62.	37.	49.5	25.
27	74.	29.558	63	30.082	56.	23.	39.5	57.	23.	40.	34.
28	50.	30.258	47.	30.262	17.	23.	20.	33.	15.	24.	18.
29	52.	30.064	69.	29 784	25.	31.	28.	34.	19.	26.5	15.
30	60.	29.722	65.	29.872	23.	15.	19.	29.	15.	22.	14.
Sum					1023.	1070.		1328.	842.		
Mean					34.1	35.6+		44.2+	28.0+		

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

November, 1897.	PRECIPITATION.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Total amount in inches.	Snowfall in inches.			
1	10 a. m.	.....	1.95	.....	N. E.	Cloudy.....	Maximum temperature, 64; date, 6th. Minimum temperature, 9; date, 24th. Mean temperature (mean max. + mean min. ÷ 2), 36 1. Mean temperature (8 + 8 ÷ 2), 34.9. Mean max. temperature, 44.2; mean min. temperature, 28. Total precipitation, 6.79 inches. Greatest precipitation in any 24 consecutive hours, 1.95; date, 1st and 2d. Total snowfall during month, 5½ inches. Depth of snow on ground at end of month, ½ inch. No. clear days, 10; partly cloudy, 6; cloudy, 14; on which .01 or more precipitation fell, 16. Prevailing wind direction, N. W.
2	.....	During night.	.87	.....	N. E.	Cloudy.....	
3	.....	.....	.....	.....	N.W.	Partly cloudy..	
4	.....	.....	.....	.....	N.	Clear	
5	Showers.		.02	.....	N. E.	Cloudy	
6	Showers.		.01	.....	N.	Partly cloudy.	
7	.....	.....	.....	....	N.W.	Partly cloudy.	
8	8.50 p. m.	.....	.17	.....	N. E.	Cloudy	
9	.....	7 p. m.	.90	.....	N. E.	Cloudy	
10	.....	.....	.....	.....	N.	Clear.....	
11	9 p. m.	....	1.45	3.	N.	Cloudy	
12	....	5 p. m.	.31	.....	N. E.	Cloudy	
13	....	.....	.....	.....	N.	Clear	
14	.....	.....	.....	.....	N. W.	Clear	
15	8 p. m.	During night.	.26	.....	N. E.	Partly cloudy..	
16	6 p. m.	During night.	.05	.....	S. E.	Cloudy	
17	....	.....	.....	.....	N.W.	Clear	
18	.....	.....	.....	.....	W.	Partly cloudy..	
19	9 p. m.	.....	.....	*	N.W.	Partly cloudy..	
20	.....	During night.	.09	.....	S. E.	Cloudy	
21	.....	.....	.....	.....	W.	Cloudy	
22	During night.		.08	1.0	N.W.	Cloudy	
23	.....	.....	.....	.....	N.W.	Clear	
24	.....	.....	.....	.....	W.	Clear	
25	4 p. m.	.....	.....	.....	S. E.	Cloudy	
26	.....	During night.	.48	.....	S. W.	Cloudy	
27	.....	.....	.....	.....	N.W.	Clear	
28	.....	.....	.....	.....	W.	Clear	
29	2 p. m.	During night.	.15	1.50	S. W.	Cloudy	
30	.....	.....	.....	.....	.....	Clear	
Sum...	.....	.....	6.79	5.5			
.....	.....	.....	.....	.....			

*Light snow.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

December, 1897.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	60.	29.952	65.	29.752	19.	29.	24.	30.	12.	21.	18.
2	60.	29.966	60.	30.220	27.	20.	23.5	30.	19.	24.5	11.
3	61.	30.244	65.	30.266	21.	25.	23.	29.	18.	23.5	11.
4	60.	30.018	67.	29.682	23.	30.	26.5	30.	17.	23.5	13.
5	53.	29.124	50.	29.322	35.	37.	36.	46.	27.	36.5	19.
6	55.	29.716	67.	29.996	27.	22.	24.5	37.	22.	29.5	15.
7	58.	29.976	65.	29.832	20.	25.	22.5	30.	19.	24.5	11.
8	60.	29.950	67.	29.996	28.	29.	28.5	34.	24.	29.	10.
9	65.	30.026	70.	30.014	32.	34.	33.	38.	29.	33.5	9.
10	67.	29.954	75.	29.788	35.	48.	41.5	54.	30.	42.	24.
11	72.	29.666	75.	29.628	46.	53.	49.5	61.	45.	53.	16.
12	63.	29.578	65.	29.560	41.	39.	40.	43.	39.	41.	4.
13	62.	29.856	68.	30.092	31.	34.	32.5	40.	30.	35.	10.
14	59.	30.082	65.	29.828	33.	40.	36.5	50.	31.	40.5	19.
15	63.	29.362	70.	29.332	40.	50.	45.	53.	39.	46.	14.
16	66.	29.580	70.	29.720	41.	37.	39.	46.	37.	41.5	9.
17	65.	29.864	75.	29.736	35.	38.	36 5	44.	35.	39.5	9.
18	69.	29.688	65.	29.732	28.	20.	24.	30.	20.	25.	10.
19	38.	29.886	60.	29.992	9.	10.	9.5	18.	9.	13.5	9.
20	57.	30.008	70.	29.794	9.	24.	16.5	24.	7.	15.5	17.
21	60.	29.404	60.	29.582	23.	24.	23.5	31.	20.	25.5	11.
22	58.	29.572	60.	29.522	10.	20.	15.	28.	14.	21.	14.
23	65.	29 320	64.	29.254	18.	23.	20.5	28.	13.	21.5	15.
24	56.	29.402	54.	29.720	13.	6.	9.5	27.	6.	16.5	21.
25	56.	29.930	62.	29.750	6.	22.	14.	22.	4.	13.	18.
26	54.	29.564	39.	29.404	26.	25.	25.5	28.	19.	23.5	9.
27	57.	29.504	60.	29.720	20.	23.	21.5	35.	19.	27.	16.
28	57.	30.000	59.	30.040	8.	12.	10.	25.	5.	15.	20.
29	56.	29 952	62.	29.800	0.	15.	7.5	22.	—4.	9.	26.
30	66.	29.452	65.	29.452	28.	37.	32 5	44.	11.	27.	33.
31	64.	29.550	62.	29.154	30.	32.	31.	38.	29.	23.5	9.
Sum...	.....	.....	.....	.....	756.	883.	.....	1095.	645.	.....	.....
Mean..	.....	.....	.....	.....	24.3+	28.5+	.....	35.3+	20.8+	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 ABOVE SEA LEVEL.

December, 1897.	PRECIPITATION.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Total amount in inches.	Snowfall in inches.			
1	.....	.....	.....	.....	N.	Cloudy.....	Maximum temperature, 61; date, 11th.
2	.....	.....	.....	.....	S.	Cloudy.....	
3	2 p. m.	During night.	.09	1.	.....	Cloudy.....	Minimum temperature,—4; date, 29th.
4	6 p. m.	During night.	.92	*	N.	Cloudy.....	Mean temperature (mean max. + mean min. ÷ 2), 28.6.
5	.....	.....	.....	.....	N. W.	Clear.....	
6	.....	.....	.....	.....	N. E.	Clear.....	
7	11 a. m.	During night.	.12	1.2	N.	Cloudy	Mean temperature (8 + 8 ÷ 2), 26.4.
8	Light	snow.	.....	*	N.	Cloudy	Mean max. temperature, 36.4—; mean min. temperature, 20.8+.
9	.....	.....	.....	.....	.....	Cloudy w'h fog	
10	.....	.....	.....	.....	.....	Cloudy.....	
11	.....	.....	.....	.....	S. W.	Clear.....	
12	9 a. m.	5 p. m.	.70	.....	N. E.	Cloudy.....	Total precipitation, 4.11 inches.
13	.....	.....	.....	.....	N. W.	Cloudy.....	
14	10 a. m.	.....	1.98	.....	E.	Cloudy.....	Greatest precipitation in any 24 consecutive hours, 2.29; date, 14th, 15th.
15	.....	5 p. m.	.31	.....	N. E.	Cloudy.....	
16	.....	.....	.....	.....	W.	Cloudy.....	
17	.....	.....	.....	.....	N. W.	Partly cloudy.	
18	.....	.....	.....	.....	N. W.	Clear.....	
19	.....	.....	.....	.....	N. W.	Partly cloudy.	By far the most of above fell within the 24 hours limit, but not all.
20	7 p. m.	During night.	.20	.	N.	Cloudy.....	
21	Light	squall.	.....	*	N.	Clear.....	Total snowfall during month, 14.25 inches.
22	.....	.....	.....	.....	W.	Clear.....	
23	During	night.	.20	2.	N. W.	Cloudy.....	
24	.....	.....	.....	.....	N. W.	Clear.....	Depth of snow on ground at end of month, (about) 10 inches.
25	.....	.....	.....	.....	W.	Clear.....	
26	.....	.....	.....	*	N. W.	Cloudy.....	
27	.....	.....	.....	.....	W.	Clear.....	
28	.....	.....	.....	.....	N. W.	Clear.....	No. of clear days, 10; partly cloudy, 3; cloudy, 18; on which .01 or more precipitation fell, 10.
29	.....	.....	.01	*	S. W.	Partly cloudy.	
30	.....	.....	.....	*	S. W.	Cloudy.....	
31	2 p. m.	During night.	.80	8.	W.	Cloudy.....	Prevailing wind direction, N. W. 15th and 16th, frost all out of ground; 17th, teams plowing.
Sum...	.....	.....	5.33	14.2			
.....	.....	.....	.....	.....			

*Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

January, 1898.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	61.	28.930	62.	29.292	21.	14.	22.5	24.	14.	19.	10.
2	65.	29.590	47.	29.630	10.	8.	9.	18.	4.	11.	14.
3	60.	29.400	63.	29.754	14.	6.	10.	25.	4.	14.5	21.
4	50.	30.560	59.	29.000	6.	7.	6.5	8.	—6.	1	14.
5	55.	29.680	65.	29.840	13.	24.	18.5	35.	6.	20.5	29.
6	58.	29.880	70.	29.712	15.	38.	26.5	45.	12.	28.5	33.
7	65.	29.320	64.	29.636	38.	32.	35.	40.	32.	36.	8.
8	62.	29.440	70.	29.352	27.	43.	35	49.	23.	36.	26.
9	53.	29.616	42.	29.736	28.	23.	25.5	31.	23.	27.	8.
10	61.	29.740	59.	29.750	9.	32.	20.5	40.	8.	24.	32.
11	62.	29.918	71.	29.900	27.	29.	28.	36.	24.	30.	30.
12	66.	29.653	70.	29.328	32.	36.	34.	37.	23.	30.	14.
13	68.	29.160	71.	29.736	46.	28.	37.	50.	28.	39.	22.
14	63.	29.916	71.	29.992	21.	25.	23.	31.	21.	26.	10.
15	62.	29.844	68.	29.408	25.	34.	29.5	34.	23.	28 5	11.
16	53.	29.470	44.	29.684	30.	21.	25.5	33.	21.	27.	12.
17	52.	29.940	60.	30.170	9.	11.	10.	21.	9.	15.	12.
18	54.	30.162	65.	30.144	—2.	21.	19.	30.	—4.	26.	34.
19	57.	30.224	62.	30.084	6.	23.	14.5	38.	5.	21.5	33.
20	61.	29.910	65.	29.306	24.	35.	29.5	38.	17.	27.5	21.
21	66.	29.538	70.	29.894	38.	29.	33 5	41.	29.	35.	11.
22	66.	30.074	65.	29.924	24.	29.	26.5	27.	23.	25.	4.
23	50.	29 332	45.	28.978	32.	27.	29.5	36.	25.	30.5	11.
24	55.	29.416	60.	29.778	19.	22.	20.5	27.	18.	22.5	9.
25	60.	29.908	65.	29.608	9.	25.	17.	28.	8.	18.	20.
26	67.	29 052	65.	29.348	24.	25.	24.5	30.	20.	25.	10.
27	60.	29.462	60.	29.516	16.	14.	15.	24.	14.	19.	10.
28	69.	29 696	65.	29.668	3.	2.	2.5	15.	1.	8.	14.
29	51.	29.602	58.	29.656	—2.	8.	6.	15.	—7.	22.	22.
30	51.	29.880	55.	29.972	—3.	—8.	—5.5	7.	—8.	-0.5	15.
31	49.	29.816	60.	29.364	—3.	18.	7.5	18.	—14.	2.	32.
Sum...	.....	.....	.....	.....	556.	681.	.....	931.	396.	.....	.....
Mean..	.....	.....	.....	.....	17.9	21.9	.....	30.0	12.8	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

January, 1898.	Precipitation.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Total amount in inches.	Snowfall in inches.			
1					N. W.	Cloudy	Maximum temperature, 50; date, 13th.
2					N. W.	Clear	
3					S. W.	Clear	Minimum temperature, −14; date, 31st.
4					N. W.	Cloudy	
5					W.	Clear	
6					S. E	Partly cloudy.	Mean temperature (mean max. + mean min. ÷ 2) 21.4.
7			.4	4.	N. W.	Partly cloudy.	
8					W.	Partly cloudy.	
9					N. W.	Partly cloudy.	
10					N. W.	Clear	Mean temperature (8 + 8 ÷ 2), 19.9.
11					N.	Clear	
12	10 a. m.	During night.	.30		N. W.	Cloudy	Mean max. temperature, 30. +; mean min. temperature, 12.8 +.
13					S. W.	Partly cloudy.	
14					S.	Cloudy	
15	10 a. m.	During night.	.28	2.	N. E.	Cloudy	Total precipitation, 3.59 inches.
16					N. W.	Clear	Greatest precipitation in any 24 consecutive hours, 1.16, date, 20th.
17					W.	Clear	
18					W.	Clear	
19					S. W.	Clear	
20	6 a. m.	8 p. m.	1.16	8.	N. E.	Cloudy	Total snow fall during month, 32 inches.
21					N. E.	Cloudy	
22	8 p. m.				E.	Cloudy	
23		3 p. m.	.93	8.	N. E.	Cloudy	No. of clear days, 14; partly cloudy, 6; cloudy, 11; on which .01 or more precipitation fell, 7. Prevailing wind direction, N. W.
24					N. W.	Clear	
25	9 p. m.				N.	Cloudy	
26		4 p. m.	.52	10.	N.	Partly cloudy.	
27					W.	Clear	
28					N. W.	Clear	
29					W.	Clear	
30					N.	Clear	
31	10 a. m.				N. E.	Cloudy	
Sum...			3.59	32.			

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8 ′ N.

February, 1808.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	54.	29.786	60.	29.324	20.	12.	16.	22.	12.	17.	10.
2	52.	29.572	62.	29.776	4.	9.	6.5	11.	3.	7.	8.
3	53.	29.902	63.	30.094	−11.	7.	−2.	15.	−18.	−1.5	33.
4	54.	30.240	63.	30.284	−6.	14.	4.	24.	−8.	8.	32.
5	56.	30.106	62.	29.894	9.	36.	22.5	38.	1.	19.5	37.
6	54.	29.882	50.	29.978	33.	27.	30.	41.	19.	30	22.
7	59.	30.004	64.	30.046	14.	33.	23.5	40.	9.	24.5	31.
8	64.	30.104	70.	30.124	24.	33.	28.5	38.	23.	30.5	15.
9	65.	30.068	73.	30.022	24.	33.	28.5	36.	23.	29.5	13.
10	69.	29.866	75.	30.012	35.	41.	38.	54.	30.	42.	24.
11	69.	30.174	74.	30.074	35.	36.	35.5	39.	36.	37.5	3.
12	70.	29.788	74.	29.654	35.	41.	38.	42.	34.	38.	8.
13	60.	29.790	57.	29.842	37.	30.	33.5	49.	30.	39.5	19.
14	60.	29.720	71.	29.596	21.	34.	27.5	42.	16.	29.	26.
15	68.	29.546	68.	29.176	29.	35.	32.	41.	27.	34.	14.
16	68.	28.528	56.	29.022	33.	13.	23.	34.	13.	23.5	21.
17	69.	29.524	60.	29.910	8.	13.	10.5	23.	7.	15.	16.
18	60.	29.924	66.	29.964	12.	27.	19.5	33.	6.	19.5	27.
19	64.	29.986	74.	30.012	30.	33.	31.5	38.	26.	32.	12.
20	48.	30.044	39.	29.932	26.	22.	24.	26.	22.	24.	4.
21	50.	29.790	67.	29.634	20.	30.	25.	33.	20.	26.5	13.
22	55.	29.566	60.	29.574	25.	35.	30.	35.	24.	29.5	11.
23	62.	29.564	70.	29.678	35.	33.	34.	35.	33.	34.	2.
24	67.	29.642	75.	29.748	32.	36.	34.	43.	30.	36.5	13.
25	66.	29.672	75.	29.760	28.	33.	30.5	48.	24.	36.	24.
26	68.	29.634	70.	29.648	29.	30.	29.5	40.	23.	31.5	17.
27	55.	29.606	49.	29.892	29.	32.	30.5	40.	24.	32.	16.
28	60.	29.550	68.	29.578	28.	29.	28.5	35.	22.	28.5	13.
Sum...	... ..	.....	.....	.....	638.	787.	.....	995.	511.	.....	
Mean..	.....	.....	.....	.....	22.7+	28.1	.....	35.5+	18.2+	.....	

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

February, 1898.	Precipitation.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Total amount in inches.	Snowfall in inches.			
1	....	2 p. m.	1.20	12	N. E.	Cloudy.	Maximum temperature, 54; date, 10th.
2	.....	.....	.....	.....	N. W.	Clear.	
3	.....	.....	.....	.....	N.	Clear.	Minimum temperature, —18; date, 3d.
4	.....	.....	.....	.....	N. W.	Clear.	
5	9 p. m.	During night.	.10	*	S. W.	Cloudy.	Mean temperature (mean max. + mean min. ÷ 2), 26.8+.
6	.....	.....	.....	.....	W.	Clear.	
7	.....	.....	.....	.....	W.	Clear.	
8	.....	.....	.....	.....	.....	Clear.	Mean temperature (8 + 8 ÷ 2), 25.4+.
9	.....	.....	.....	.....	S. W.	Partly cloudy.	
10	.....	.....	.....	.....	S.	Cloudy.	Mean max. temperature, 35.5+; mean min. temperature, 18.2+.
11	.....	.....	.....	.....	S.	Cloudy.	
12	10 a. m.	5 p. m.	.22	.....	N. E.	Cloudy.	
13	.....	.....	.....	.....	N. W.	Clear.	
14	8 p. m.	During night.	.....	*	N.	Partly cloudy.	Total precipitation, 3.03 inches.
15	2 p. m.	During night.	.3	.....	E.	Cloudy.	Greatest precipitation in any 24 consecutive hours, .6; date, 1st.
16	8 a. m.	During night.	.....	*	N. W.	Cloudy.	
17	.....	.....	.....	.....	.....	Partly cloudy.	Total snowfall during the month, 17 inches.
18	4 p. m.	During night.	.....	*	N. E.	Cloudy.	
19	....	.....	.....	.....	N.	Cloudy.	Depth of snow on ground at end of month, 9 inches.
20	9 a. m.	.....	.....	.....	N. E.	Cloudy.	
21	.....	.....	.48	3	N. E.	Cloudy.	
22	.....	.....	.45	.....	N. E	Cloudy.	No. of clear days, 9; partly cloudy, 6; cloudy, 13; on which .01 or more precipitation fell, 8.
23	.....	5 p. m.	.28	2	N. E.	Cloudy.	
24	.....	.....	.....	.....	S. W.	Partly cloudy.	
25	.....	.....	.....	.....	N. E.	Partly cloudy.	
26	.....	.....	.....	.....	N. W.	Partly cloudy.	
27	.....	.....	.....	.....	N. W.	Clear.	
28	.....	.....	.....	.....	N. W.	Clear.	Prevailing wind direction, N. E.
							From Jan. 31, 9 p.m., till Feb. 1, 8.30 p. m., traffic was absolutely blocked on railroad.
							Feb. 2, trains 1 to 2 hours late.
							Feb. 5, the trace of snow came during the middle of the day.
							Sleet from 9 a. m. Feb. 20, until 5 p. m. on 22d; then turned to rain; 23d, turned to snow at 11 a. m.
Sum...	.....	.....	3.03	17			
..	.....	.....	.....	.....			

*Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

March, 1898.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	63.	29.628	70.	29.672	24.	32.	28.	40.	18.	29.	22.
2	66.	29.760	70.	29.828	24.	33.	28.5	39.	20.	29.5	19.
3	65.	29.852	65.	29 982	30.	30.	30.	40.	29.	34.5	11.
4	64.	30.024	66.	29.804	22.	32.	27.	36.	18.	27.	18.
5	69.	29.690	68.	29.896	31.	33.	32.	40.	26.	33.	14.
6	57.	30.076	54.	30.072	28.	35.	31.5	48.	23.	35.5	25.
7	63.	30.144	72.	30.150	25.	34.	29.5	42.	17.	29.5	25.
8	69.	30.122	65.	30.046	29.	35.	32.	49.	23.	36.	26.
9	68.	30.038	68.	30.032	29.	42.	35.5	58.	23.	40.5	35.
10	70.	30.074	71.	30.056	34.	43.	38.5	57.	29.	43.	28.
11	71.	30.058	76.	29.966	34.	42.	38.	63.	29.	46.	34.
12	73.	29.860	70.	29.790	40.	47.	43.5	52.	37.	44.5	15.
13	63.	29.650	64.	29.486	40.	55.	47.5	62.	36.	49.	26.
14	65.	29.644	63.	29.770	41.	40.	40.5	48.	35.	41.5	13.
15	60.	29.936	64.	30.082	33.	30.	31.5	44.	30.	37.	14.
16	60.	30.134	65.	29.978	28.	35.	31.5	38.	19.	28.5	19.
17	58.	29.630	66.	29.698	39.	46.	42.5	57.	29.	43.	28.
18	65	29.894	68.	29.920	41.	40.	40.5	52.	33.	42.5	19.
19	62.	29.760	65.	29.520	36.	39.	37.5	41.	33.	37.	8.
20	58.	29.434	55.	29.726	51.	42.	46.5	57.	37.	47.	20.
21	53.	29.836	63.	29.908	35.	36.	35.5	47.	33.	40.	14.
22	57.	30.000	60.	29.808	32.	36.	34.	43.	26.	34.5	17.
23	60.	29.310	62.	29.630	38.	37.	37.5	64.	34.	49.	30.
24	62.	29 904	62.	29.968	33.	31.	32.	38.	27.	32.5	11.
25	63.	30.064	62.	30.292	33.	34.	33.5	47.	21.	34.	26.
26	62.	30.452	64.	30.430	36.	36.	36.	45.	25.	35.	20.
27	56.	30.300	55.	30.216	39.	36.	37.5	48.	32.	40.	16.
28	61.	30.228	64.	30.140	42.	39.	40.5	40.	30.	35.	10.
29	60.	30.004	66.	29.984	39.	42.	40.5	46.	40.	43.	6.
30	62.	29.892	65.	29.794	43.	39.	41.	50.	39.	44.5	11.
31	62.	29.620	65.	29.596	32.	36.	34.	39.	32.	35.5	7.
Sum...	.....	.....	.....	.....	1061.	1167.	1114.	1470.	883.	1176.5	
Mean..	.....	.....	.....	.....	34.1+	37.6	35.9	47.4	28.4	38.	

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

March, 1898.	PRECIPITATION.				Prevailing wind direction.	Character of day.	Remarks.
	Time of beginning.	Time of ending.	Total amount in inches.	Snowfall in inches.			
1	.....	.....	.....	.....	W.	Clear.	Maximum temperature, 64; date, 23d.
2	.....	.....	.....	.....	N. W.	Partly cloudy.	
3	.....	.....	.....	.....	N. W.	Cloudy.	Minimum temperature, 17; date, 7th.
4	8 p. m.	During night.	.37	6.	N.	Partly cloudy.	Mean temperature (mean max. + mean min. ÷ 2), 37.9.
5	.....	.....	.....	.....	N. W.	Clear.	
6	.....	.....	.....	.....	N. W.	Clear.	
7	.....	.....	.....	.....	.....	Clear.	
8	.....	.....	.....	.....	N. W.	Clear.	Mean temperature (S + S ÷ 2), 35.8.
9	.....	.....	.....	.....	W.	Clear.	
10	.....	.....	.....	.....	W.	Clear.	Mean max. temperature, 47.4; mean min. temperature, 28.4.
11	.....	.....	.....	.....	S. W.	Clear.	
12	6 a. m.	4 p. m.	.10	.....	.....	Partly cloudy.	
13	During day.		*	.....	S. E.	Cloudy.	
14	.....	.....	.....	.....	W.	Clear.	Total precipitation, 1.56 inches.
15	.....	.....	.....	.....	N. W.	Clear.	
16	During night.		.03	.....	S.	Cloudy.	Greatest precipitation in any 24 consecutive hours, .41; date, 18th–19th.
17	.....	.....	.....	.....	W.	Clear.	
18	During night.	.....	.....	.....	S. W.	Clear.	
19	.....	During night.	.41	.....	S. E.	Cloudy.	Total snowfall during the month, 8.5 inches.
20	.....	.....	.....	.....	W.	Clear.	
21	.....	.....	.....	.....	W.	Clear.	Depth of snow on ground at end of month, traces.
22	7 p. m.	During night.	.07	.....	S. E.	Cloudy.	
23	.....	.....	.....	.....	W.	Partly cloudy.	No. of clear days, 17; partly cloudy, 6; cloudy, 8; on which .01 or more precipitation fell, 7.
24	.....	.....	.....	.....	S.	Clear.	
25	.....	.....	.....	.....	S. W.	Clear.	
26	.....	.....	.....	.....	N. W.	Clear.	
27	.....	.....	.....	.....	W.	Partly cloudy.	
28	.....	.....	.....	.....	E.	Cloudy.	
29	3 p. m.	During night.	.23	.....	E.	Cloudy.	Prevailing wind direction, W.
30	During night.	.....	.....	.....	E.	Partly cloudy.	15th evening, northern lights very plain.
31	.....	2 p. m.	.35	2.5	E.	Cloudy.	
Sum...	.....	.....	1.56	8.5			
.....	.....	.....	.....	.....			

*Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

April, 1898.	8 A. M.		8 A. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	58.	29.600	55.	29.792	28.	32.	30.	40.	27.	33.5	13.
2	54.	29.734	60.	29.596	32.	32.	32.	42.	20.	31.	22.
3	52.	29.546	39.	29.792	25.	23.	24.	33.	21.	27.	12.
4	45.	29.746	56.	29.768	26.	36.	31.	43.	14.	28.5	29.
5	49.	29.762	53.	29.682	28.	30.	29.	33.	27.	30.	6.
6	50.	29.544	56.	29.556	27.	30.	28.5	37.	24.	30.5	13.
7	52.	29.488	58.	29.606	37.	39.	38.	45.	25.	35.	20.
8	56.	29.570	65.	29.764	42.	45.	43.5	54.	32.	43	22.
9	62.	29.874	68.	29.828	45.	46.	45.5	65.	27.	46.	38.
10	65.	29.820	60.	29.828	45.	43.	44.	60.	30.	45.	30.
11	66.	29.888	67.	29.892	50.	45.	47.5	63.	36.	49.5	27.
12	53.	29.812	65.	29.798	48.	48.	48.	64.	32.	48.	32.
13	58.	29.630	53.	29.436	50.	53.	51.5	62.	43.	52.5	19.
14	56.	29.368	60.	29.366	43.	41.	42.	53.	40.	46.5	13.
15	55.	29.312	59.	29.276	40.	42.	41.	44.	39.	41.5	5.
16	54.	29.274	60.	29.420	38.	47.	42.5	52.	37.	44.5	15.
17	62.	29.462	61.	29.964	57.	61.	59.	71.	36.	53.5	35.
18	60.	29.600	57.	29.824	52.	44.	48.	55.	44.	49.5	11.
19	64.	29.966	53.	29.786	47.	42.	44.5	56.	30.	42.	26.
20	57.	29.506	58.	29.458	38.	43.	41.5	44.	35.	39.5	9.
21	57.	29.386	55.	29.582	44.	45.	44.5	54.	38.	46.	16.
22	62.	29.718	60.	29.712	48.	52.	50.	60.	38.	49.	22.
23	58.	29.598	62.	29.722	46.	44.	45.	51.	43.	47.	8.
24	52.	29.578	49.	29.492	42.	44.	43.	44.	40.	42.	4.
25	52.	29.568	48.	29.798	41.	38.	39.5	43.	38.	40.5	5.
26	46.	29.778	54.	29.984	38.	38.	38.	44.	35.	39.5	9.
27	58.	30.058	56.	29.990	41.	36.	38.5	45.	28.	36.5	17.
28	49.	29.862	42.	29.646	36.	36.	36.	42.	32.	37.	10.
29	48.	29.432	60.	29.396	37.	42.	39.5	43.	35.	39.	8.
30	65.	29.504	66.	29.692	50.	53.	51.5	59.	39.	49.	20.
Sum...	.....	.....	.....	.....	1221.	1250.	.....	1501.	985.	.....	.....
Mean..	.....	.....	.....	.....	40.7	41.6+	.....	50.	32.6+	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

April, 1898.	PRECIPITATION. Time of beginning.	PRECIPITATION. Time of ending.	PRECIPITATION. Total amount in inches.	PRECIPITATION. Snowfall in inches.	Prevailing wind direction.	Character of day.	Remarks.
1	.....	.....	.....	*	W.	Clear.	Maximum temperature, 71; date, 17th.
2	1 p. m.	4 p. m.	.....	*	S.	Cloudy.	
3	.....	.....	.....	.....	W.	Clear.	Minimum temperature, 14; date, 4th.
4	During night.	.....	.....	.....	S.	Partly cloudy.	Mean temperature (mean max. + mean min. ÷ 2), 41.3.
5	.....	.....	.....	.....	N.	Cloudy.	
6	.....	7 a. m.	.50	7.	S. W.	Partly cloudy.	
7	.....	.....	.....	.....	N. W.	Clear.	
8	.....	.....	.....	.....	N. W.	Clear.	Mean temperature (8 + 8 ÷ 2), 41.1.
9	.....	.....	.....	.....	W.	Clear.	
10	.....	.....	.....	.....	W.	Clear.	Mean max. temperature, 50; mean min. temperature, 32.6+.
11	.....	.....	.....	.....	W.	Clear.	
12	.....	.....	.....	.....	W.	Clear.	
13	During night.		.04	.....	N. E.	Partly cloudy.	
14	4.30 p. m.	.....	.05	.....	E.	Cloudy.	Total precipitation, 5.37 inches.
15	.....	.....	.98	.....	N. E.	Cloudy.	
16	.....	2 p. m.	.02	.....	N.	Cloudy.	Greatest precipitation in any 24 consecutive hours, 2.04; date, 24th and 25th.
17	.....	.....	.....	.....	N. W.	Clear.	
18	.....	.....	.....	.....	N. W.	Clear.	
19	8 p. m.	.....	.....	.....	W.	Partly cloudy.	
20	.....	8 a. m.	.51	.....	N.	Cloudy.	
21	4.45 p. m.	5 p. m.	.02	.....	W.	Partly cloudy.	Total snowfall during the month, 7 inches.
22	.....	.....	.....	.....	W.	Partly cloudy.	
23	During night.	8 a. m.	.41	.....	N. E.	Cloudy.	No. of clear days, 12; partly cloudy, 6; cloudy, 12; on which .01 or more precipitation fell, 13.
24	During night.	.....	.....	.....	N. E.	Cloudy.	
25	.....	During night.	2.04	.....	N.	Cloudy.	
26	Showers, p. m.	.....	.04	.....	N.	Cloudy.	
27	.....	.....	.02	.....	N. E.	Clear.	Prevailing wind direction, N. W.
28	4 p. m.	.....	.....	.....	N. E.	Cloudy.	
29	Showers.	8 a. m.	.60	.....	N. E.	Cloudy.	Date of sleet, 29th, 8 p. m.
30	.....	.....	.14	.....	N. W.	Clear.	Showers afternoon and night of 25th and 26th.
Sum...	.....	.....	5.37	7.			

* Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

May, 1898.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Ranged.
1	56.	29.708	65.	29.714	53.	55.	54.	65.	44.	54.5	21.
2	74.	29.784	65.	29.818	52.	48.	50.	66.	38.	52.	28.
3	62.	29.832	65.	29 904	43.	42.	42.5	54.	41.	47.5	13.
4	62.	29.798	58.	29.796	42.	44.	43.	52.	39.	45.5	13.
5	66.	29.690	63.	29.612	53.	52.	52.5	64.	42.	53.	22.
6	62.	29.548	65.	29.492	48.	51.	49.5	72.	41.	56.5	33.
7	72.	29.480	67.	29.408	56.	53.	54.5	76.	38.	51.	38.
8	53.	29.432	54.	29.552	46.	41.	43.5	54.	40.	47.	14.
9	59.	29.706	59.	29.710	44.	40.	42.	55.	36.	35.5	19.
10	65.	29.774	58.	29.732	49.	44.	46.5	62.	28.	45.5	34.
11	66.	29.766	64	29.726	55.	55.	55.	68.	37.	52.5	31.
12	65.	29.748	69.	29.632	54.	63.	58.5	73.	47.	60.	26.
13	73.	29.700	70.	29.676	60.	54.	52.	73.	51.	62.	22.
14	71.	29.706	70.	29.778	58.	52.	55.	69.	42.	55.5	27.
15	71.	29.826	65.	29.742	64.	54.	59.	66.	40.	53.	26.
16	61.	29.766	63.	29.632	49.	49.	49.	50.	49.	49.5	1.
17	67.	29.524	61.	29.604	57.	50.	53.5	65.	46.	55.5	19.
18	65.	29.730	64.	29.732	55.	55.	55.	71.	43.	57.	28.
19	71	29.638	75.	29.592	66.	66.	66.	83.	50.	66.5	33.
20	80	29.508	75.	29.878	74.	69.	70.	79.	64.	71.5	15.
21	75.	30.008	68.	30.072	66.	56.	61.	71.	46.	58.5	25.
22	71.	30.042	64.	29.960	60.	55.	57.5	69.	39.	54.	30.
23	66.	29.920	68.	29.798	53.	58.	55.5	71.	43.	57.	28.
24	64.	29.776	63.	29.688	54.	52.	53.	56.	51.	53.5	5.
25	61.	29.670	60.	29.744	50.	48.	49.	51.	49.	50.	2.
26	59.	29.752	61.	29.708	50.	50.	50.	56.	48.	52.	8.
27	58.	29.530	60.	29.516	52.	52.	52.	55.	46.	51.5	9.
28	57.	29.566	60.	29.584	55.	55.	55.	60.	51.	55.5	9.
29	62.	29.592	65.	29.532	54.	55.	54.5	66.	51.	58.5	15.
30	65.	29.512	70.	29.499	61.	63.	62.	74.	59.	64.	20.
31	64.	29.598	70.	29.684	64.	59.	61.5	75.	51.	63.	24.
Sum...	.....	.....	.....	.....	1697.	1647.	.....	2031.	1385.	.....	.....
Mean..	.....	.....	.....	.....	54.7+	53.	.....	65.5+	44.7—	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

May, 1898.	PRECIPITATION. Time of beginning.	Time of ending.	Amount in inches.	Snowfall in inches.	Prevailing wind direction.	Character of day.	Remarks.
1					N. E.	Clear.	Maximum temperature, 83; date, 19th.
2					E.	Clear.	
3	Showers.		.01		E.	Cloudy.	Minimum temperature, 28; date, 10th.
4	Showers.		.06		E.	Cloudy.	
5	Showers.		.01		S. E.	Partly cloudy.	Mean temperature (mean max.+mean min. ÷2), 55.1.
6	During night.		.58		N. W.	Clear.	
7					S. W.	Clear.	
8					E.	Cloudy.	Mean temperature (8+8÷2), 53.9.
9					N. E.	Clear.	
10					E.	Clear.	Mean max. temperature, 65.5; mean min. temperature, 44.7.
11					S.	Partly cloudy.	
12					S. E.	Partly cloudy.	
13					S. E.	Clear.	Total precipitation, 3.79 inches.
14					S. E.	Partly cloudy.	
15	4 p. m.				S.	Partly cloudy.	Greatest precipitation in any 24 consecutive hours, 1.21; date, 24th and 25th.
16			.15		N. E.	Cloudy.	
17		During night.	.07		N. W.	Clear.	
18					W.	Clear.	Number of clear days, 12; partly cloudy, 9; cloudy, 10; on which .01 or more precipitation fell, 14.
19	7.30 p. m.	9 p. m.	.10		S.	Clear.	
20					N. W.	Partly cloudy.	
21					S. E.	Clear.	
22					S. E.	Clear.	
23	9 p. m.				S. E.	Cloudy.	
24			.64		S. E.	Cloudy.	Prevailing wind direction, S. E.
25		During night.	1.21		E.	Cloudy.	
26	During night.		.90		N. E.	Cloudy.	
27		During night.			N. E.	Cloudy.	
28					N. E.	Cloudy.	
29	During night.		.06		E.	Partly cloudy.	
30					N. E.	Partly cloudy.	
31					N. E.	Partly cloudy.	
Sum...			3.79				

* Trace.

METEOROLOGICAL

DURHAM, STRAFFORD COUNTY, NEW HAMPSHIRE. LAT. 43° 8′ N.

June, 1898.	8 A. M.		8 P. M.		TEMPERATURE.						
	Attached thermometer.	Barometer.	Attached thermometer.	Barometer.	8 a. m.	8 p. m.	Mean.	Maximum.	Minimum.	Mean.	Range.
1	68.	29.766	75.	29.742	59.	55.	57.	71.	51.	61.	20.
2	65.	29.762	62.	29.734	57.	55.	56.	58.	55.	56.5	3.
3	62.	29.784	60.	29.866	57.	54.	55.5	56.	52.	54.	4.
4	60.	29.946	60.	29.998	55.	54.	54.5	65.	52.	58.5	13.
5	70.	29.960	68.	29.886	58.	52.	55.	66.	46.	56.	20.
6	67.	29.894	68.	29.894	59.	58.	58.5	70.	52.	61.	18.
7	72.	29.854	70.	29.848	62.	57.	59.5	76.	49.	62.5	27.
8	72.	29.780	88.	29.570	64.	76.	70.	81.	49.	65.	32.
9	82.	29.506	84.	29.754	75.	71.	73.	80.	62.	71.	18.
10	88.	29.832	78.	29.851	65.	61.	63.	75.	60.	67.5	15.
11	67.	29.588	71.	29.653	53.	67.	60.	70.	50.	60.	20.
12	67.	29.852	80.	29.620	75.	67.	71.	85.	60.	72.5	25.
13	75.	29.654	72.	29.720	61.	60.	60.5	67.	56.	62.	11.
14	74.	29.622	74.	29.453	57.	63.	60.	72.	55.	63.5	17.
15	68.	29.753	74.	29.952	65.	57.	61.	70.	61.	65.5	9.
16	77.	30.016	72.	29.876	61.	61.	61.	72.	38.	55.	34.
17	72.	29.860	77.	29.816	64.	66.	65.	78.	47.	62.5	31.
18	74.	29.818	77.	29.706	69.	65	67.	77.	42.	59.5	35.
19	80.	29.516	70.	29.372	62.	62.	62.	68.	57.	62.5	11.
20	68.	29.424	75.	29.462	64.	65.	64.5	74.	55.	64.5	19.
21	75.	29.432	72.	29.596	62.	58.	60.	71.	56.	63.5	15.
22	72.	29.694	74.	29.756	66.	57.	61.5	70.	48.	59.	22.
23	76.	29.834	78.	29.498	65.	65.	65.	75.	54.	64.5	21
24	72.	29.588	78.	29.444	69.	74.	71.5	84.	54.	69.	30.
25	73.	29.240	80.	29.314	78.	72.	75.	90.	65.	77.5	25.
26	83	29.412	84.	29.644	76.	75	75.5	88.	67.	77.5	21.
27	88.	29.764	78.	29.786	69.	69.	69.	81.	60.	70.5	21.
28	78.	29.782	70.	29.712	64.	59.	61.5	68.	61.	64.5	7.
29	75.	29.670	82.	29.716	69.	67.	68.	83.	57.	70.	26.
30	75.	29.814	80.	29.712	69.	66.	67.5	80.	59.	67.5	21.
Sum...	.....	.....	.....	.....	1929.	1988.	.....	2221	1630.	.....	.....
Mean..	.....	.....	.....	.....	64.3	66.3	.....	74.	54.3+	.....	.....

RECORD.

LONG. 70° 56′ W. BAROMETER 125 FEET ABOVE SEA LEVEL.

June, 1898.	PRECIPITATION. Time of beginning.	Time of ending.	Amount in inches.	Snowfall in inches.	Prevailing wind direction.	Character of day.	Remarks.
1	During night.				N. E.	Partly cloudy.	Maximum temperature, 90; date, 24th.
2			.02		N.	Cloudy.	Minimum temperature, 38; date, 16th.
3	12 m.	8 a. m.	.03		N. E.	Cloudy.	
4		12 m.	.44		N. E.	Partly cloudy.	Mean temperature (mean max.+mean min.÷2), 64.1+
5					E.	Clear.	
6					N.	Clear.	
7	6.30 p. m.	8 p. m.	.06		S. E.	Partly cloudy.	Mean temperature (8+8÷2), 65.3.
8			*		N. W.	Partly cloudy.	
9			*		N. W.	Clear.	Mean max. temperature, 74; mean min. temperature, 54.3.
10					N.	Partly cloudy.	
11	During night.		.01		S. E.	Cloudy.	
12	3 p. m.	Shower.	.01		N. E.	Partly cloudy.	Total precipitation, 2.14 inches.
13	During night.		.25		S. E.	Cloudy.	
14					S. E.	Cloudy.	Greatest precipitation in any 24 consecutive hours, 1.04; date, 18th and 19th.
15					N. W.	Clear.	
16					N. W.	Clear.	
17					S.	Clear.	
18	8 p. m.				S. E.	Partly cloudy.	Number of clear days, 11; partly cloudy, 12; cloudy, 7; on which .01 or more precipitation fell, 12.
19			1.04		S.	Cloudy.	
20		During night.	.17		W.	Clear.	
21					W.	Partly cloudy.	
22					S. W.	Partly cloudy.	
23					S.	Clear.	Prevailing wind, S.E.
24					S. W.	Clear.	
25	Showers p.m.				S. W.	Partly cloudy.	8th, heavy thunder to north, in p. m.
26		During night.	.11		W.	Clear.	14th, thunder to n'th, in p. m.
27					S. E.	Partly cloudy.	25th, thunder storms on all sides, in p.m. and continued into evening. Strong winds, followed by gentle showers.
28			*		E.	Cloudy.	
29			*		S. E.	Clear.	
30					S. E.	Partly cloudy.	
Sum...			2.14				

* Trace.

METEOROLOGICAL SUMMARY.

	Average temperature.		Precipitation.*		Snow in inches.		No. days .01 inch precipitation.		1897–1898.			
	1896-1897.	1897-1898.	1896-1897.	1897-1898.	1896-1897.	1897-1898.	1896-1897.	1897-1898.	Prevailing wind direction.	Days clear.	Days partly cloudy.	Days cloudy.
July	70	69	2.85	6.98	.....	.....	11	9	E.	9	9	13
August	67	66	3.68	2.99	.....	.....	9	10	W.	15	12	4
September	58	59	9.48	2.71	.....	.....	11	8	W.	15	5	10
October	46	49	2.50	.49	.....	.....	13	5	W.	15	10	6
November	40	36	3.47	6.79	1.7	5.5	8	16	N. W.	10	6	14
December	24	27	1.76	5.33	3.5	14.2	5	10	N. W.	10	3	18
January	23	21	4.84	3.59	17.7	32.0	9	7	N. W.	14	6	11
February	25	26	2.31	3.03	13.5	17.0	5	8	N. E.	9	6	13
March	32	37	4.40	1.56	12.0	8.5	10	7	W.	17	6	8
April	46	41	2.50	5.39	.....	7.0	11	13	N. W.	12	6	12
May	55	55	4.94	3.79	.....	.....	10	14	S. E.	12	9	10
June	60	65	8.85	2.14	.....	.....	11	12	S. E.	11	12	7
Sum	546	551	51.6	44.8	48.4	84.2	113	119	W.,N.W.	149	90	126
Mean	45.5	45.9										

*Including rain, hail, sleet, and melted snow in inches.

APPENDIX

THE BIRDS OF

BELKNAP AND MERRIMACK COUNTIES

NEW HAMPSHIRE

BY NED DEARBORN, M. S.

A

PRELIMINARY LIST

OF THE

BIRDS

OF

BELKNAP AND MERRIMACK COUNTIES

NEW HAMPSHIRE

WITH NOTES

BY

NED DEARBORN

PRESENTED TO THE FACULTY OF THE NEW HAMPSHIRE COLLEGE
OF AGRICULTURE AND THE MECHANIC ARTS AS A THESIS
FOR THE DEGREE OF MASTER OF SCIENCE,
JUNE, 1898

DURHAM
NEW HAMPSHIRE COLLEGE
1898

PREFACE.

As a basis for the following pages, I have taken my own observations for the past ten years. To these I have added all that I could obtain from other reliable sources, giving credit to my informant in every case. The list is certainly incomplete, but so far as it goes, it is authentic. I am under especial obligations to Charles F. Goodhue of Webster, who has furnished more than thirty names. He has had a long experience as a taxidermist, and has a thorough knowledge of our birds. I am also indebted to George Stolworthy, formerly of Franklin, a taxidermist and oölogist who has contributed the names of several rare varieties to the list, and to others whose names appear in the text.

In the notes I have mentioned whatever impressed me as of value for comparison of future with present conditions, and also peculiarities of songs, food, nests, season of migration, etc., which I have noticed. The migration items were averaged,—my record covering the decade from 1888 to 1898.

I have followed the nomenclature adopted by the American Ornithologists' Union in its check-list of 1895.

NED DEARBORN.

BIOLOGICAL LABORATORIES, NEW HAMPSHIRE COLLEGE,
DURHAM, June 1, 1898.

BIRDS OF BELKNAP AND MERRIMACK COUNTIES.

Order PYGOPODES.

Family PODICIPIDÆ.

Colymbus holbœllii. Red-necked Grebe.

The Red-necked Grebe seems to be of regular, though not of very common, occurrence. Only two have come to my notice. One was found dead by Frank T. Collins of Alton, who had it mounted and still keeps it. This specimen was in breeding plumage, and was picked up in a field where it had evidently fallen in a state of exhaustion while pursuing its migration. Once on the ground it was helpless, being neither able to walk nor fly, and starvation and death inevitably followed. In ordinary weather such an occurrence is not likely to happen, but the stress of storms must work occasional havoc with divers in this way. The other bird was shot in the fall of 1895 in Lake Winnisquam, and its skin is now in my possession. I know of no evidence to show that this grebe nests here.

Colymbus auritus. Horned Grebe.

I have never seen this species, but Mr. Goodhue assures me that he has seen it in his locality.

Podilymbus podiceps. Dabchick.

The Dabchick or Pied-billed Grebe, though far from common, is easily overlooked, and likely to be thought rarer than it really is.

The name Dipper Duck is commonly applied to all grebes indiscriminately in this section. The term is better applied along the coast where it is used to designate the Buffle Head duck.

Family URINATORIDÆ.

Urinator imber. Loon.

The number of loons that frequent the waters of this section has plainly decreased within the last two decades. Twenty years ago they bred every summer at one or more of the ponds which are the headwaters of the Suncook river. Their quavering cries were familiar to every one within a radius of

five miles about Crystal lake. But the small waters have proved too favorable to wanton hunters. Those which have not been killed have been frightened away, and I doubt if a single pair has nested there within the last twelve years. Loons formerly nested at Kelley pond in New Hampton. I am not informed whether they still do so or not. They do breed, however, regularly at Lake Winnipesaukee where there is plenty of room for them to avoid their enemies. Loons sometimes come to grief from unusual causes. Not many years ago one was caught at Winnipesaukee by a fisherman while trolling for trout. Col. Thomas P. Cheney of Ashland has a mounted loon that put off its southward migration till the lake was frozen completely over, when it was unable to launch itself into the air and was easily captured. A loon in the water or in the air is able to look out for itself, but on land it is helpless. I have known a half grown bird that was lying on a little beach enjoying the sun, to be overtaken and captured by a boy before it could get into deep water.

I have seen three loon's nests. The first was discovered July 4, 1893. It contained a young one a few days old. The shell from which he came lay about him, not having been taken away. He was covered with stiffish black down. The nest was without lining of any sort, being simply a spot cleared of leaves and fallen twigs. It was well hidden behind a huge boulder that had been split by the frost, and the halves moved apart nearly a foot. The water, being high that year, flooded the crevice, affording an easy passage to the dense growth of bushes that fringed the shore. The nest was within fifteen inches of the water. June 18, 1895, I found another nest. This was on a sandy beach in full view. The nest was hollowed out of the sand, and the edges were raised a little so there was no danger of the contents rolling out. It contained two fresh eggs, and was within two feet of the water. The eggs were left untouched, but one of the old birds was shot at, and during the following night the eggs were removed to another site half a mile away where they were rediscovered on the next day. This last nest was in full view on a rocky shore. It showed no preparation beyond a clearing out of sticks and loose pebbles. I am unable to suggest any probable method by which the eggs were conveyed from one nest to the other. All these nests were on small islands where there was no danger of invasion by foxes, skunks, or other prowling animals. The water was very low in 1895, which I think accounts for the nests being placed in open situations, the birds not being able to reach the bushes.

Urinator lumme. Red-throated Loon.

The Red-throated Loon is an occasional migrant. It is vouched for by Mr. Goodhue, as having a place on this list.

Family ALCIDÆ.

Alle alle. Dovekie.

The Dovekie, though essentially a maritime bird, is sometimes blown inland during northeast storms. I have seen one that was killed in Warren, Grafton county, and Mr. Goodhue announces that it has been seen in Merrimack county.

Order LONGIPENNES.

Family LARIDÆ.

Larus argentatus smithsonianus. Herring Gull.

The Herring Gull occasionally appears during spring and fall for brief passing visits. Mr. Irving Haynes of Franklin has a mounted specimen that was killed at Webster lake. The only one I ever saw living in that region was on Little bay near East Tilton in October, 1896.

Larus philadelphia. Bonaparte's Gull.

Bonaparte's Gull is placed on the list by Mr. Goodhue. It is of unusual occurrence.

Sterna hirundo. Common Tern.

This species is an irregular visitor according to Mr. Goodhue.

Sterna fulignosa. Sooty Tern.

The Sooty Tern, like the last, is given a place here on the testimony of Mr. Goodhue. I have never seen either of them.

Order ANSERES.

Family ANATIDÆ.

Merganser americanus. Fish Duck.

Fish Ducks, or, as they are commonly called, Sheldrakes, begin to appear in the lakes about the first of November. Most of them move southward in December, though numbers remain in the Winnipesaukee and Merrimack rivers all winter. They feed largely, perhaps exclusively, on fish and frogs. An old male, examined by me March 20, 1897, contained two or three small shiners and a bull frog. The toes of the frog were still in the duck's neck, while its shoulders were in the stomach, the head having been digested off. Another male, shot April 5, 1892, contained only sand and fish-bones. Sheldrakes are sometimes eat-

able, but more often are too rank and fishy. They retire northward as spring advances, and are not seen after the middle of April.

Lophodytes cucullatus. Hooded Merganser.

The Hooded Merganser is never an abundant visitor, though it occurs, singly or in pairs, with considerable regularity. On the 4th of April, 1894, I observed a pair of these ducks on the Winnipesaukee river for some time. They were feeding near the shore, and exhibited many sportive ways, diving and splashing very actively. In 1895, I saw another pair in the same locality. This was also early in April.

Anas boschas. Mallard Duck.

The Mallard Duck is a rare visitor. Mr. Thomas R. Payson of Northfield furnishes all the information I have been able to get concerning its presence here. In the last fifteen years he has shot three on the Winnipesaukee river. The last one, a drake, was winged, in October, 1895, taken home alive and kept till it grew quite tame, but in the following February, a weasel killed it.

Anas obscura. Black Duck.

Black Ducks are abundant during the spring and fall, and occasionally remain through the summer to breed in secluded places. They are usually more plentiful in spring than in autumn. The mass of them either pass over in the fall without alighting or take another route. I have seen a female of this species with two young ones at Crystal lake, Gilmanton, in August, and have no doubt the young were hatched in that vicinity. A pair passed the summer of 1895 in the Winnipesaukee river above Tilton, though they did not succeed in rearing any young. Of two stomachs of Black ducks, taken in April, one was filled with bulbous grass roots, while the other contained a single larval worm and a great quantity of seeds from grasses which grew by the water.

Anas carolinensis. Green-winged Teal.

The Green-winged Teal is of only casual occurrence. I know of but one that has been killed near Tilton. Mr. Goodhue reports it from his locality.

Aix sponsa. Wood Duck.

Wood Ducks are regular visitors every year, and are not rare summer residents. They sometimes occur in small flocks in spring, but more commonly singly or in pairs. In autumn they are usually in flocks of from six to twelve, headed by an old

drake. A pair bred near Tilton in 1892, and again in 1893. The young ducks were adroit hiders, keeping near the brushy shores where they could dodge out of sight on short notice. The crop of a wood duck, killed in October, contained white-oak acorns.

Aythya marila nearctica. American Scaup Duck.

The Big Scaup Duck is a migrant which is not often seen. I am indebted to Mr. Goodhue for the knowledge of its occurrence.

Aythya affinis. Lesser Scaup Duck.

The Lesser Scaup Duck occurs similarly to the last, and is added to this list by the same observer.

Aythya collaris. Ring-necked Duck.

The Ring-necked Duck is another casual visitor that I have never run across, and know of as being found here only through Mr. Goodhue.

Glaucionetta clangula americana. Whistler.

The Golden Eye or Whistler is a common winter resident along the Winnipesaukee and Merrimack rivers, appearing first on the lakes in November, and finally descending into the rivers when the larger bodies of water are frozen over. They dive to the bottom for their food, keeping well out from shore, and are exceedingly difficult to approach. They leave for their northern breeding grounds before April 15. Their bodies are small, and their flesh is usually too rank for food, though they are sometimes eaten. A single stomach taken near Tilton, March 28, 1892, contained sand, chitinous remains of insects, and some black vegetable matter.

Charitonetta albeola. Buffle-head.

This duck is not of common occurrence. It is noted by Mr. Goodhue.

Clangula hyemalis. Old Squaw.

This is another of Mr. Goodhue's finds that has never come to my notice. It is a common duck in the tide-water districts, spring and fall.

Oidemia deglandi. Velvet Scoter.

The White-winged or Velvet Scoter is common on the coast, but rather rare in this region. Mr. Goodhue is authority for its presence in this list.

Erismatura rubida. Ruddy Duck.

This is another irregular visitor noted by Mr. Goodhue.

Branta canadensis. Wild Goose.

Wild Geese are seen in abundance during their migrations, but comparatively few alight here in spring, and none in autumn. Only those alight in spring which have made undue haste, and come before northern waters are open. One March morning some years ago, I saw a flock of seventeen standing erect in a field within thirty rods of my home. It had been raining hard all night, and they were tired. They did not remain very long, for, seeing people stirring about so near them, they resumed their flight in a weary manner.

Branta bernicla. Brant.

The Brant Goose is reported by Mr. Goodhue. Its presence here must be regarded as exceptional, as the ocean is usually its home while in this latitude.

Order HERODIONES.

Family IBIDIDÆ.

Plegadis autumnalis. Glossy Ibis.

This is a rare bird in New England. It is placed on this list on the strength of the following from Mr. Goodhue: "I have also seen a specimen of Glossy Ibis, said to have been shot at Alton, and I have no reason to doubt it."

Family ARDEIDÆ.

Botaurus lentiginosus. Bittern.

The Bittern or Stake Driver is a common summer resident wherever there are marshes. It is far better known by its guttural cry than by sight. It is a solitary, dejected looking creature with a tendency to sneak away into the grass as one approaches unless surprised at close quarters, when it flies with a steady and rather slow motion, and a few hoarse *quarks*. While making my way carefully through a rank growth of rushes, I once came quite near a bittern, and observed him several minutes before he took alarm. He stood on a stranded log with wings drooping, bill pointed upward, and eyes half closed, turning his head from time to time, peering into the sky first with one eye and then with the other, to all appearances totally oblivious of everything about him, and wholly given over to day-dreams. A wounded bittern at bay is a hideous looking creature. Its head is brought near the ground and drawn back close to its body. Its eyes flash. Its wings are partially opened, and every feather stands on end. In such an attitude one will face its pursuer and wait motionless, excepting for an occasional wicked wink, for a chance to strike with its spear-like bill.

Ardetta exilis. Least Bittern.

Mr. Goodhue writes: "I am quite sure the Least Bittern has been taken at or near Bradford." This species is reported in the vicinity of Hanover, and doubtless deserves a place on this list.

Ardea herodias. Great Blue Heron.

The Great Blue Heron breeds here sparingly. Its season is from the first of April to the last of November. The only nest of which I have known was in an old growth of pine situated in a large swamp. The young were supplied with food from a pond nearly two miles away. Blue herons wade in the paddy margins of ponds and streams, and destroy many small pickerel as well as other fish, and frogs.

Ardea virescens. Green Heron.

Green Herons are pretty evenly distributed regardless of population, which restricts the shyer Blue Heron to back districts. They select a thick growth of pines, or other coniferous trees, in which to build their nests. The young ones remain in the tree-tops long after they leave the nest, hopping from branch to branch and from tree to tree almost as nimbly as squirrels. This heron is a resident from May till September.

Nycticorax nycticorax nævius. Night Heron.

The Black-crowned Night Heron is a common resident during the summer near the coast, but is rather rare in central New Hampshire. In ten years' observation, I have never seen one here, but Mr. Goodhue states that he has observed it in his vicinity.

Order PALUDICOLÆ.

Family RALLIDÆ.

Rallus virginianus. Virginia Rail.

The Virginia Rail is a rarity, the presence of which is vouched for by Mr. Goodhue.

Fulica americana. Coot.

The Coot or Mud-hen is not a rare autumnal visitor. I have never known one to be seen in spring. They seem to live chiefly on the water, frequenting marshes where there is plenty of herbage in which to secrete themselves. The stomach of one killed late in September, and examined by me, contained only sand and bits of grass.

Order LIMICOLÆ.

Family SCOLOPACIDÆ.

Philohela minor. American Woodcock.

The Woodcock is one of the earliest spring arrivals, coming about April 1, and though the majority pass on, a few remain to breed. A nest containing a single addled egg was found in Alton a number of years ago. It was discovered by laborers while clearing a pasture, in a thick growth of pines, on the ground. As this was in August, the other eggs had probably been fruitful and hatched. During September, woodcocks are sought in swampy places, but later, after the leaves are fallen, they are often found on high ground.

Gallinago delicata. Wilson's Snipe.

Wilson's Snipe is a regular migrant, most noticeable in the fall, but never common. I never saw more than two or three in a season. They may be found in a marsh, a meadow, or in brush land, but always near water. I have usually found them in October, in one instance as late as the 20th. The earliest date that I have observed a snipe is September 17. It is not plentiful enough to be important as a game bird.

Tringa maculata. Pectoral Sandpiper.

I have met this bird once in Belknap county, at Alton, August 20, 1889. It was with other sandpipers, but I saw no more of its kind. I saw a flock of about a dozen at Squam lake, Grafton county, October 10, 1892, and was told they had been there several weeks, so they are likely to be found occasionally in numbers.

Tringa minutilla. Least Sandpiper.

Least Sandpipers seem to be regular autumn visitors, coming about August 20, and leaving by September 1. I have seen them in considerable numbers at Woodman's pond, Alton, whenever I have visited it between the above dates.

Totanus melanoleucus. Greater Yellow-Legs.

The Greater Yellow-legs, common enough coastwise, is only a straggler here. It is admitted to this list on the testimony of Mr. Goodhue.

Totanus flavipes. Lesser Yellow-Legs.

The Lesser Yellow-legs has come to my notice in but a single instance. This was at Woodman's pond August 20, 1889. This bird was so tame, that I had to wave my hat at it within thirty feet to make it fly. Like the preceding species, this normally belongs to tide-water.

Totanus solitarius. Solitary Sandpiper.

The Solitary Sandpiper is a common migrant, and I believe it to be a summer resident, though absolute proof of it is not at hand. I have observed it repeatedly both spring and fall. I once witnessed an interesting battle between a Solitary and a Spotted sandpiper. They locked bills and pushed each other to and fro, neither one making any decided headway. After a time the Solitary gave up and withdrew, leaving his smaller combatant master of the field. Both were very dirty from struggling in the mud, and their first move after separating was to wash themselves thoroughly. The Solitary now moved out of my sight, while the Spotted, wearied almost to exhaustion, lay down in the sunshine, and remained for nearly half an hour, when he arose and moved off at my approach.

Bartramia longicauda. Upland Sandpiper.

Upland Sandpipers, or Plovers, as they are usually called, are common summer residents on hill farms. They run about the fields with an easy gliding motion that is pleasing to watch. On cloudy spring mornings they make extended flights high in air, often sailing with rigid wings and giving utterance to a prolonged trilled whistle in two syllables, ending with a cadence. They alight readily on trees, fences, and even buildings. They have an odd habit of holding their wings up vertically over their backs for a moment on alighting, when they are alarmed or annoyed. Their nests are placed in open fields or pastures, in slight depressions, and lined with grass. The eggs are four in number, and are considerably larger than partridge eggs, though a plover weighs only a third as much as a partridge.

Actitis macularia. Spotted Sandpiper.

The Spotted Sandpiper is an abundant summer resident, arriving about May 1. It is to be seen along the shores of every pond and river, wending its way with dainty steps, investigating all the holes and corners and bobbing its tail as if in a state of high nervous tension. It is careful to nest on high ground, and the young are reared away from the water.

Family CHARADRIIDÆ.

Aegialitis semipalmata. Ring-neck Plover.

The Ring-neck Plover is only an occasional migrant away from the salt water. About August 23, 1889, I saw a pair at Woodman's pond, Alton.

Order GALLINÆ.

Family TETRAONIDÆ.

Colinus virginianus. Bob White.

The Bob White or Quail is found in limited numbers. The whistle of the cock is heard here and there during the summer months, but they will hardly average more than one to a township. In twenty years I knew only four to visit the neighborhood where I resided in Alton. About Tilton they are more common. During the past five years I have heard at least one every summer, and a flock of a dozen stayed in the vicinity of the village through the winter of 1893-94. This region seems to be about at the northern limit of the quail's range.

Bonasa umbellus. Ruffed Grouse.

The Partridge or Ruffed Grouse holds first place among our game birds in the heart of the sportsman. In number they vary greatly from year to year. During wet seasons comparatively few young are raised, and after two or three such seasons in succession, partridges are scarce. But propitious seasons follow, and they increase rapidly in numbers.

Tympanuchus americanus. Prairie Hen.

The appearance of the Prairie Hen in New Hampshire in recent years is evidently due to adventitious causes. I think it was in March, 1893, that one was shot in Sanbornton. It was mounted, and is now in the possession of Mr. Will Stewart, Franklin. Mr. Goodhue tells of another that was killed in Boscawen, where several more were seen by a friend of his. I learn from the superintendent of Blue Mountain park, Croydon, that a number of prairie hens were turned loose in the park several years ago, and that none of them were ever seen afterwards. This is a sufficient explanation of the cases above noted.

Order COLUMBÆ.

Family COLUMBIDÆ.

Ectopistes migratorius. Passenger Pigeon.

Wild Pigeons, formerly so abundant as to afford a lucrative employment to numerous gunners and netters, are now practically unheard of in New Hampshire. I have neither seen or known to be seen a single pigeon in the last ten years. Fifty years ago they bred here, and I have been given a clear description of a nest found in Merrimack county. It was in a pine tree, and constructed so loosely of sticks that the eggs could be seen from the ground through the bottom.

Zenaidura macroura. Mourning Dove.

The Mourning Dove is an irregular and rather uncommon visitor. It usually appears singly or in pairs about the time the spring migration is fairly commenced, or again in September. Mr. George Stolworthy writes me that he has seen it quite often about Franklin. I have rarely met it anywhere.

Order RAPTORES.

Family FALCONIDÆ.

Elanoides forficatus. Swallow-tailed Kite.

This species, although a southern bird, is accredited to New England by Capt. Charles Bendire, in his "Life Histories of Birds." The only specific instance of its occurrence in this state that has come to my knowledge is furnished by George Stolworthy, who states that he saw one in Franklin in 1875. It picked up a snake within one hundred feet of him, where he had a good chance to see it, so there can be little doubt as to the identification.

Circus hudsonius. Marsh Hawk.

The Marsh Hawk is a tolerably common summer resident, coming about April 1, and remaining until November. During the mating period, which occurs early in May, the males exhibit a curious habit of tumbling. I have seen one, while pursuing a female, tumble repeatedly from a height of thirty feet almost to the ground, as if he had been shot, and then rise directly to fall again the next moment a little farther on. I have never known a marsh hawk to offer to attack poultry.

Accipiter velox. Sharp-shinned Hawk.

The Sharp-shinned Hawk is a summer resident, ordinarily most noticeable in autumn loitering about cherry and sour-gum trees, and preying on the robins, cherry-birds, and flickers that are attracted by the fruit. They are very destructive to small chickens. About June 1, 1888, I found a nest of this hawk in Alton, containing five eggs partially incubated. It was in a hemlock, forty feet from the ground. Except for its smaller size it could not have been distinguished from a Cooper's hawk's nest, being lined with the same sort of hemlock scales used by the latter bird, and thus bearing out the striking similarity existing between the two species. I found another nest half built April 18, 1890, in Gilmanton. It was in a small hemlock, about fifteen feet from the ground, and in the midst of a dense thicket that was part of a large tract of timber land. Both birds

were at work on the nest. These hawks seem to be paired when they come north, and immediately select a place for a nest. They are very noisy at this season, and I was led to the discovery of both nests by their cries.

Accipiter cooperii. Cooper's Hawk.

The Cooper's Hawk is one of our commonest species, and undoubtedly causes more damage to poultry and game than any other hawk. It builds, so far as I am able to discover, in coniferous trees. Two nests examined by me resembled crow nests in outward appearance, but were different in the interior, being lined with small scales of bark from young hemlock trees. One was sixty feet from the ground, well hidden in a hemlock; the other was in a pine, not more than thirty feet high and in full view. The last nest, containing one fresh egg and two slightly incubated, was found on the 30th of May.

Accipiter atricapillus. Goshawk.

Goshawks are chiefly winter visitants, some years being fairly common, while in others they are rare. In 1897, George A. Phelps of Belmont discovered a goshawk's nest in Dunbarton. It was fifty feet from the ground, in a pine, and contained three young ones. When first seen, the old bird was on the nest. She was shot and sent to Thomas R. Payson of Northfield, in whose possession her skin now is. The above is the only instance of the goshawk's nesting in this section that has come to my notice.

Buteo borealis. Red-tailed Hawk.

The Red-tailed Hawk is a regular summer visitor in the more elevated sections. I have found it the predominating "henhawk" about the Gilford mountains and adjacent hills of Belknap county. Red-tails sometimes remain all winter. I shot a large female in Gilmanton on the 20th of January, 1894. The mercury at the time stood near zero. They occupy the same nest year after year if unmolested. Though not usually troublesome to poultry, they occasionally fall into evil ways. A pair once came into my own yard and killed a hen each. By some means they had acquired an appetite for fowl, and gave considerable trouble afterwards, until the female was shot. Meadow mice are a favorite article of diet, and I have taken two full-grown mice, entire, from the gullet of one of these hawks.

Buteo lineatus. Red-shouldered Hawk.

The Red-shouldered Hawk is commoner in most localities than the Red-tail, which it resembles in figure and habit, though it is smaller. In the Merrimack valley, Red-shouldered hawks are

plentiful while Red-tails are rare indeed during the breeding season. It is well known that the former has the more southerly range, and the relative position of their local habitats confirms the fact,—altitude compensating for latitude in case of the Red-tail. This species, like the last, occupies the same nest in successive seasons.

Buteo latissimus. Broad-winged Hawk.

The Broad-winged Hawk is not common. I am not aware of having seen more than two alive. The wariness which characterizes the other Buteos is lacking in this. Both of the individuals that have come to my notice regarded me with indifference at a distance of fifty feet. They were adults, and were seen, one in May, the other in August, both being in Alton.

Archibuteo lagopus sancti-johannis. Rough-legged Hawk.

Rough-legged Hawks are known here only as rare migrants. I am not aware of ever having seen one living, but Mr. Henry Osgood of Pittsfield has told me of a large number that passed in loose flocks over Catamount mountain in his town one day late in November a few years ago. He also has a mounted specimen in melanistic plumage that was killed in his vicinity.

Aquila chrysaëtos. Golden Eagle.

The Golden Eagle is a rare visitant from the mountains. Mr. Goodhue is authority for its occurrence.

Haliæetus leucocephalus. Bald Eagle.

Bald Eagles are tolerably common every summer about lakes and ponds, particularly Winnipesaukee lake, and the bays along the river that drains it. They feed upon fish and frogs which they catch near shore, not disdaining to eat carrion thrown up by the waves. The horned pout seems to be a common victim, the mother fish falling an easy prey as she guards her shoal of little black babies where the water is but a few inches deep. Pouts' heads are sure to be found on rocks frequented by eagles. They hunt by traversing the shores with short flights, and by side trips on foot for closer examination, when they may be seen clambering about over stones or in the mud as the case may be. Again, they will sit by the hour on some commanding perch, watching for whatever may show up. They usually roost in the same place as long as they remain in a single locality, and if there are several in the neighborhood, they generally assemble at nightfall to spend the night together, though whether from sociability or expediency I am not able to state.

Falco peregrinus anatum. Duck Hawk.

The Duck Hawk can scarcely be called a rarity in this province, although it undoubtedly is so in the greater part of it. About the middle of May, 1896, a duck hawk was brought to me that had been shot in Alexandria, a border town in Grafton county. The young man who shot it informed me that that kind of a hawk might be seen there any year, but most often during the latter part of the summer. He was evidently well acquainted with it, for he gave me a good account of its flight. Afterward, I got a similar report from a hunter in the same town. Judging from this evidence it is probable that the duck hawk nests somewhere in that region, and is certain to be found in Bristol and neighboring towns. That country is favorable for the duck hawk, offering as it does plenty of water and mountains. Mr. Goodhue reports it from his vicinity.

Falco columbarius. Pigeon Hawk.

The Pigeon Hawk or American Merlin is rare. I have never seen it, but it is vouched for by Mr. Goodhue, who has occasionally observed it at Webster.

Falco sparverius. Sparrow Hawk.

The Sparrow Hawk is common spring and fall, and is now and then a resident through the summer. On a number of occasions I have observed these birds in June and July. Some years ago, a pair occupied a hollow pine stub in Northfield for several seasons. They begin to arrive about the middle of April and return during the latter part of September. In the week following the 20th of the latter month, they are abundant on the hills, where they post themselves on fence stakes and solitary trees to watch for insects.

Pandion haliaëtus carolinensis. Osprey.

The Osprey or Fish Hawk is a common migrant, coming in April and hovering a few weeks about streams and inundated meadows, on the watch for suckers, which at this time are in shallow water to deposit their spawn. It appears again late in August, and patrols the waters for several weeks.

Family BUBONIDÆ.

Asio wilsonianus. Long-eared Owl.

The Long-eared Owl is reported by Mr. Goodhue. I have never found it in this portion of the state.

Asio acciptrinus. Short-eared Owl.

This species is also added to the list by Mr. Goodhue.

Syrnium nebulosum. Barred Owl.

The Barred Owl appears to be more plentiful than all the other owls combined. It evidently breeds about Tilton, as I have had quite a number brought in that were killed in the vicinity in a single season, as if from the same brood. Although of good size, it is apparently a beneficial species, feeding chiefly on nocturnal rodents.

Nyctala tengmalmi richardsoni. Richardson's Owl.

Richardson's Owl is a rare visitor from the North. Mr. Goodhue has one in his collection that was killed in his neighborhood. I have no other evidence of its appearance here.

Nyctala acadica. Saw-whet Owl.

The Saw-whet Owl, in point of numbers, comes next to the Barred Owl. One in my collection was caught in a corridor of the Conference Seminary at Tilton, which it had entered through an open window. They sometimes enter barns, but are usually killed by thoughtless farmers who do not understand that the little owl can do no harm, but will only clear the place of mice. A few years ago, Mr. Henry Osgood of Pittsfield killed as many as five in one locality, indicating plainly they were of one family and raised in that vicinity.

Megascops asio. Screech Owl.

Screech Owls are not common. I have never seen or heard more than half a dozen all told. The uncanny cry of a screech owl once heard will never be forgotten.

Bubo virginianus. Great Horned Owl.

The Great Horned Owl is of only occasional occurrence, usually appearing in cold weather. It is especially hated by crows and hawks. Though usually on bad terms among themselves, I have seen Red-shouldered hawks and crows unite forces to pester this common enemy. This is the only owl that attacks poultry. I have known one to kill two guinea hens in a single night, and return for more the night following. They are pretty certain to come back for a second visit, and may then be easily trapped. It is evident that this owl attacks skunks, and I have no doubt with success, from the fact that three fourths of those that have fallen into my hands were strongly scented.

Nyctea nyctea. Snowy Owl.

Snowy Owls are occasional winter visitors. At least three have been killed in this district within the last ten years. One was killed in Loudon about ten years ago. It was mounted by Henry Osgood of Pittsfield, who had it in his possession at last ac-

counts. Another was shot on Bean hill, Northfield, about November 15, 1893. It is now owned by Mr. Will Stewart of Franklin. This owl sat on the ground in a field nearly all day before the owner's curiosity was sufficiently aroused to investigate. There was no snow at the time. Last fall, 1897, another was shot in Sanbornton, according to the local papers.

Surnia ulula caperoch. Hawk Owl.

The Hawk Owl is an uncommon visitor from the North. Mr. George Stolworthy states that one was killed in Sanbornton in the breeding season, and mounted by him.

Order COCCYGES.

Family CUCULIDÆ.

Coccyzus americanus. Yellow-billed Cuckoo.

The Yellow-billed Cuckoo is not common. The only pair I ever saw alive were in a piece of inundated woods in Northfield, June 24, 1897. They appeared to be located there, though I think had not begun a nest. Another was brought in by a boy who said he found it dead, the same season. Previous to this, I had no knowledge of the yellow-bill in this section.

Coccyzus erythrophthalmus. Black-billed Cuckoo.

The Black-billed Cuckoo is a common inhabitant of damp thickets from near the middle of May till about the 1st of October. It is the object of sharp attack by robins whenever it visits orchards, and I have known one even to enter a barn to escape a scourging from a pair of these birds.

Family ALCEDINIDÆ.

Ceryle alcyon. Belted Kingfisher.

The Belted Kingfisher is to be found by every pond and river from early spring till late autumn, and occasionally all winter. One wintered on the Suncook river in 1889-90, and I have seen at least one at Tilton in midwinter.

Order PICI.

Family PICIDÆ.

Dryobates villosus. Hairy Woodpecker.

This species, next to the Downy, is our most abundant resident woodpecker. It is equally at home in all sorts of woods, either high or low.

Dryobates pubescens. Downy Woodpecker.

The Downy Woodpecker is our best known species. It is familiar in orchards, and must be reckoned among our most

useful birds. Neither this species nor the last show any tendency to migrate so far as I can observe.

Picoides arcticus. Black-backed Three-toed Woodpecker.

This woodpecker is an irregular visitor from the White Mountain region, that only appears in winter. All that I have known of, here or farther south, have been females. One seen by me in Alton, about December 20, 1890, was at work on a hemlock, which was quite stripped of its outer layer of bark as if she had continued on the same tree for a whole day at least. They seem to feed almost exclusively on coniferous trees.

Picoides americanus. Ladder-backed Three-toed Woodpecker.

The Ladder-backed Three-toed Woodpecker is far more rare than the last. It has been found here by Mr. Goodhue.

Sphyrapicus varius. Yellow-bellied Woodpecker.

Yellow-bellied Woodpeckers are quite local in their distribution, breeding regularly in some places and rarely appearing in others. They build their nests in both dead and living wood, being the only woodpecker I have ever known to drill its hole in the growing portion of a tree.

Ceophlœus pileatus. Pileated Woodpecker.

The Pileated Woodpecker is rather uncommon, yet not rare. A year seldom passes that I do not see at least one. They are more often observed in cold weather than in summer, which indicates a roving nature, though hardly a migratory one. The work of this woodpecker is noticeable in pines infested by borers, and on decaying oaks which afford a home for numberless larvæ under the loose bark. It occasionally breeds here.

Melanerpes erythrocephalus. Red-headed Woodpecker.

The Red-headed Woodpecker is a straggler from the South. I have seen but two, both in Alton.

Colaptes auratus. Flicker.

The Flicker or Yellow Hammer is an abundant summer bird, and a rare winter resident. I have twice seen a flicker in Alton in January. It is not unusual for a few to winter near the coast where the snow is not very deep and the red cedar furnishes an abundance of berries. I suspect that those now and then seen inland are scouts from Strafford or Rockingham counties.

Order MACROCHIRES.

Family CAPRIMULGIDÆ.

Antrostomus vociferus. Whip-poor-will.

The Whip-poor-will is a familiar denizen of low woodland, particularly near water where there are plenty of flying insects for its food. It is more strictly nocturnal than the Night hawk, and is known by sight to but few people.

Chordeiles virginianus. Night Hawk.

The Night Hawk is a frequenter of high open land, thus dividing the country with its relative, the whip-poor-will. It often flies by day, and frequently roosts on fence rails by the roadside, so it is one of our well known birds. The cause of the heavy sound made by night hawks has been a subject of some discussion, but I am positive that it is due to the wings alone.

Family MICROPODIDÆ.

Chetura pelagica. Chimney Swift.

Chimney Swifts arrive about May 1, and leave in September. They are of especial interest because they have deserted their primitive homes in hollow trees since the advent of civilized people.

Trochilus colubris. Ruby-throated Humming Bird.

The Ruby-throated Humming Bird is a common summer resident, arriving usually about the second week in May, and leaving towards the middle of September. Of three nests that have come to my notice, one was in an apple tree just in the outskirts of a village; the other two were in the woods, one being in a beech tree, the other in a hemlock. All were from seven to fifteen feet from the ground. The last nest was found July 15, and contained eggs nearly ready to hatch.

Order PASSERES.

Family TYRANNIDÆ.

Tyrannus tyrannus. King Bird.

The King Bird belongs to every farm from May 1 to September 1.

Myiarchus crinitus. Great-crested Flycatcher.

The Great-crested Flycatcher is of local distribution. I have always found it at Alton, but not often about Tilton. On an average, it is tolerably common throughout this section. Though it usually lives in the woods, I have known a pair to nest in the hollow branch of an apple tree by the side of a highway, where it was passed by many people every day.

Sayornis phœbe. Pewee.

The Pewee is an abundant summer resident, coming the first week in April and leaving early in October. Males come a week or ten days earlier than females, and select a home the first thing, even on the day of their coming. Pewees rarely build in their primitive haunts now, preferring artificial retreats constructed by man. But while the location is changed, the architecture remains the same. The same green moss from the brookside covers the mud-walled nest that was formerly used to mask it among the verdure of cliffs and banks. I have sometimes found pewee's eggs with tiny pink spots upon them. Each time they were nearly ready to hatch, and I attribute the unusual appearance to this fact.

Contopus borealis. Olive-sided Flycatcher.

The Olive-sided Flycatcher is of regular, and fairly common occurrence. It prefers a scattering growth of large trees, such as the worthless remnants of a timber lot that has been cleared, or the brown ash and sour gum trees that tower above the tangled underbrush of swamps. Mr. Henry Davis of Tilton tells me of a nest which he found, that resembled a King Bird's in structure, and was built in a tall hemlock where it was quite invisible from the ground.

Contopus virens. Wood Pewee.

The drawled cry of the Wood Pewee is a familiar sound in all sorts of woodland from spring till autumn. It is not confined to the woods alone, but often visits orchards and shade trees.

Empidonax flaviventris. Yellow-bellied Flycatcher.

The Yellow-bellied Flycatcher is not a very common migrant. On an average I have scarcely seen one a year.

Empidonax trailii. Traill's Flycatcher.

Traill's Flycatcher is a regular summer resident in suitable places. It is fond of the water, and I have never found it away from swampy localities.

Empidonax minimus. Least Flycatcher.

There are few orchards that are not enlivened from May till September by the abrupt notes and nervous movements of the Least Flycatcher. It nests almost invariably in apple trees.

Family ALAUDIDÆ.

Otocoris alpestris. Horned Lark.

The Horned Lark is usually seen in winter, gleaning a living of seeds from a bare knoll or of grain from droppings in the road. Ordinarily not more than one or two are observed at a

time; though once, toward the latter part of April, I saw a flock of twenty or more alight in a newly sown wheat field. One was shot, and its stomach examined. It contained a few grains of wheat, but the proportion to other food was too small to be of any consequence.

FAMILY CORVIDÆ.

Cyanocitta cristata. BLUE JAY.

The Blue Jay is a resident species, though it is uncertain whether the individuals that spend the summer here are the same that winter here. In the fall when nuts are ripe, blue jays move in flocks from wood to wood in search of beechnuts, chestnuts, and acorns,—the two first being preferred. Later, these flocks disappear, and though the number that spends the winter probably equals the number of summer residents, it is much less than the throng of autumn. Migration is evident, but its extent is not known.

Perisoreus canadensis. CANADA JAY.

I have never seen the Canada Jay here, but I am assured of its occasional presence by both Mr. Osgood of Pittsfield and Mr. Goodhue of Webster.

Corvus corax principalis. RAVEN.

According to local papers, a Raven was trapped in Canterbury a few years since. The trap was set near some carrion in early spring. Mr. Goodhue puts it on his list, but whether from this instance or another I am not informed.

Corvus americanus. CROW.

Crows are too numerous and too notorious to deserve more than passing mention.

FAMILY ICTERIDÆ.

Dolichonyx oryzivorus. BOBOLINK.

Bobolinks are abundant from the middle of May till the last of August, though a few are seen a month after the latter date. From a study of bobolink's songs in different localities, I am convinced that the same birds return to the same farms year after year; also that both quality and delivery of songs continue practically constant in a family through the generations.

Molothrus ater. COW BIRD.

The Cow Bird is rather local. I rarely saw one in Alton except during migration. About Tilton it is a plentiful species.

Agelaius phœniceus. RED-WINGED BLACKBIRD.

The Red-winged Blackbird is one of the earliest arrivals in

spring, and also one of the first to leave. Old and young assemble in flocks as soon as the young are able to fly readily, and by the 20th of August they are off for the coast region, where they remain for a month or so wandering about in a desultory fashion before finally going South.

Sturnella magna. Meadow Lark.

Meadow Larks are common in some localities, and almost unknown in others. I have known them to breed yearly on a certain hill in Gilmanton, and rarely or never visit farms a mile away. They nest every summer near Tilton, but I have not found them in the surrounding neighborhoods.

Icterus galbula. Baltimore Oriole.

Baltimore Orioles are common in all quarters. I have noticed variations in their songs similar to those mentioned concerning the bobolink. The orioles of one neighborhood do not sing just like those of another. I once caught a young one before he could fly, and raised him. He lived two years, and sang each spring in the same style that belonged to his parent. As he began singing the first spring before there were any orioles in the North, and the season of song was about over at the time of his capture, it is plain that in this case, heredity and not mimicry established the song.

Scolecophagus carolinus. Rusty Blackbird.

Rusty Blackbirds are plentiful during spring and fall. They invariably go in flocks while here, feeding on high land or low as happens, but always going to the swamps to sleep. Although a Rusty's voice is harsh when sounded alone, a chorus at vespertide, all sitting close together in a naked treetop over a dreary swamp, is charming. A strong feature of the concert is the evident method upon which it is conducted. It begins with a solo, continues as a fugue till every bird is singing, and finally ends as abruptly as the Third Regiment band.

Quiscalus quiscula æneus. Crow Blackbird.

The Crow Blackbird is a common summer resident. It does not often go about in flocks like other blackbirds, though it not infrequently is seen in company with other varieties of blackbirds. This species cultivates the society of man for the food that may be gained. It nests more frequently on the outskirts of villages than elsewhere.

Family FRINGILLIDÆ.

Pinicola enucleator. Pine Grosbeak.

Pine Grosbeaks are irregular winter visitors. A few may be seen every winter, but it is only now and then that they are

common. They were very abundant during the exceptionally severe winter of 1874-75. The mercury was low, and the snow deep for a long time, but there was a large quantity of apples left hanging on the trees, and upon these the grosbeaks chiefly fed. The seeds were the favorite portion, though I believe more or less pulp was eaten. I think they had not been common before for a good many years, as few people had ever seen one. They have not been so abundant since, though they were very common during the winter of 1889-90, and again in 1895-96, both mild seasons. The proportion of red birds to dark ones is about one to twelve as they go. They feed much on seeds of basswood and white ash, and the buds of pine, maple, and apple trees.

Carpodacus purpureus. Purple Finch.

The Purple Finch, like others of its tribe that fly well, is erratic, but nevertheless common from March to October. It stands among our best singers.

Loxia curvirostra minor. Red Crossbill.

This species, like the next, is very erratic in its movements. It is far more common, however, and appears every year. Once in a while, red crossbills are very plentiful even as late as July. The male has a clear, sweet song, which I have heard in March. This species has a queer way of hiding. I have seen a flock of thirty alight in three small trees—two maples and a hemlock—and secrete themselves so well that I could count less than six upon close scrutiny from all quarters.

Loxia leucoptera. White-winged Crossbill.

White-winged Crossbills are of unusual occurrence, normally due in cold weather but never out of season. The only specimens I ever saw in this section were a flock that visited Alton, July 25, 1889.

Acanthis linaria. Red-poll Linnet.

The Red-poll Linnet is a winter visitor of varying abundance. Some years there are many, others, few or none. They come in November, and depart in April. Seeds of the different varieties of birch furnish the bulk of their food, though other trees, and even weeds and grasses contribute to their fare.

Spinus tristis. Goldfinch.

Goldfinches or Thistle Birds are common residents the year round. They are gregarious, hardly separating to rear their young, and pass their time foraging in companies of six to thirty. They are late in their wooing, and rarely begin family cares before July, and frequently not until August.

Spinus pinus. Siskin.

The Pine Siskin is an irregular visitor from northern regions. It is sometimes associated with goldfinches in winter.

Plectrophenax nivalis. Snow Bunting.

Snow Buntings are sometimes seen frequently, and again not more than once or twice in a whole winter. They are free as the wind, and never remain long in one place. I once saw a single bird in October, and Mr. Goodhue has shown me a specimen taken in June. Both are exceptional occurrences.

Poocætes gramineus. Vesper Sparrow.

The Bay-winged Bunting or Vesper Sparrow is an abundant resident of fields and well-grazed pastures from the first week in April till the last of October.

Ammodramus sandwichensis savanna. Savanna Sparrow.

The Savanna Sparrow is tolerably common in fields, though neither its feeble song nor its timid presence are likely to attract casual attention. It comes about the middle of April and leaves about the middle of October.

Ammodramus savannarum passerinus. Yellow-winged Sparrow.

I have never found the Yellow-winged Sparrow common anywhere, but have usually run across one or two each season in the neighborhood of Tilton.

Ammodramus henslowii. Henslow's Sparrow.

Henslow's Sparrow is rare. I only know of it through Mr. Goodhue, who has found it near his place.

Zonotrichia leucophrys. White-crowned Sparrow.

The White-crowned Sparrow is only found as a migrant, and not very common at that. It is fond of brambles and roadside tangles, and is often seen in company with its white-throated congener.

Zonotrichia albicollis. White-throated Sparrow.

White-throated Sparrows are plentiful along brushy highways and fences, spring and fall, and breed here sparingly, usually selecting low land overgrown with bushes, such as is offered by a recently cleared wood lot.

Spizella monticola. Tree Sparrow.

Tree Sparrows find a home here from October until April. Their appearance is practically the date of the Chippy's disappearance, and *vice versa*. Most of them go farther south, but there are always tree sparrows to be seen throughout the winter.

Spizella socialis. CHIPPING SPARROW.

The Chipping Sparrow is one of the most abundant birds in our avi-fauna. Its friendly disposition and harmless ways have gained for it especial privileges. It breeds in orchard and trellis, and multiplies under man's protecting influence.

Spizella pusilla. FIELD SPARROW.

The Field Sparrow is a common dweller on upland farms, favoring pastures where there are plenty of small pines, hardhacks, and boulders. Its nest is placed indifferently in low bushes or on the ground under a small pine.

Junco hyemalis. JUNCO.

Black Snow-birds or Juncos are chiefly migrants, being abundant for about six weeks during spring and fall. They breed on Kearsarge mountain in Warner, and also on Bean hill, Northfield.

Melospiza fasciata. SONG SPARROW.

The Song Sparrow is the first of its tribe to come north when winter is over. In point of numbers it is probably our most abundant species, exceeding even the robin in this respect.

Melospiza georgiana. SWAMP SPARROW.

The Swamp Sparrow is plentiful in low, wet localities, but is not often seen elsewhere.

Melospiza lincolnii. LINCOLN'S SPARROW.

Lincoln's Sparrow is a rare species, reported by Mr. Goodhue.

Passerella iliaca. FOX SPARROW.

Fox Sparrows are common in March and April, and again in November. They are usually in flocks, and stay pretty closely in the woods. They may be found in thick young pines or among bushes and small trees of other sorts. Occasionally, I have heard the song of this sparrow. It is not unlike that of the vesper sparrow, only louder and clearer. I know of no sparrow's song surpassing this in melody.

Pipilo erythrophthalmus. CHEWINK.

Chewinks are common denizens of neglected pastures and roadsides from the first of May till October. They are never far away from a bush patch into which they scud on the first provocation.

Passer domesticus. ENGLISH SPARROW.

The "hoodlum" English Sparrow seems to have about reached its limit of abundance. Winters are so severe that only the hardiest survive. I have observed no increase at Tilton in seven years. I have rarely seen one in the country.

Habia ludoviciana. Rose-breasted Grosbeak.

The Rose-breasted Grosbeak is a summer resident to a limited extent. Hardly a summer passes that I do not see one or two, seldom more. I have no doubt a pair nested near Tilton last spring ('97), as I regularly observed a male singing every morning in the same locality.

Passerina cyanea. Indigo Bird.

Indigo Birds are common every summer in pastures and roadsides, the male being quite apparent with his striking color and persistent singing. The female is one of our shyest birds, quite unlike her husband in that respect as well as in her coloration.

Family TANAGRIDÆ.

Piranga erythromelas. Scarlet Tanager.

The Scarlet Tanager is fairly common. Its habit of following the tops of high trees in the woods makes it less often seen than many other birds of equal abundance. Its song strongly resembles a robin's, only it is much more hurriedly uttered.

Piranga rubra. Summer Tanager.

The Summer Tanager is a rare species here. The only report of its occurrence that has reached me comes from George Stolworthy of Franklin, who writes as follows: "In the early part of the summer of 1875, I saw a number of males of the summer tanager. I have never seen or heard of them being seen there since."

Family HIRUNDINIDÆ.

Progne subis. Purple Martin.

The Purple Martin is perhaps more favored and catered to than any other bird. Its antipathy for hawks is only second to the king-bird's, and on this account houses have been put up for its use. It has entirely forsaken its ancestral trees for artificial abodes.

Petrochelidon lunifrons. Eaves Swallow.

The Cliff or Eaves Swallow, though still somewhat local, owing to its highly gregarious habits, is increasing in numbers and gradually forming new communities. It is destined to be one of our most abundant swallows.

Chelidon erythrogaster. Barn Swallow.

The Barn Swallow is our most abundant species. Every open barn has at least one nest.

Tachycineta bicolor. White-bellied Swallow.

White-bellied Swallows usually put in an appearance during the first week in April, and few remain after the middle of

August. They choose various nesting places. Though they prefer bird-houses, a hollow tree, or a rat-hole at the eaves of an old house will answer very well. I know of a pair that nests regularly between the outer and inner walls of a factory, although it is full of working machinery.

Clivicola riparia. Bank Swallow.

The Bank Swallow is abundant in places where there are sand banks of the proper consistency for safe drilling; elsewhere they are seldom seen. I have been informed by a veteran concreter, Mr. Howard of New Hampton, that bank swallows follow his workmen into new places, showing no fear of them and drilling their holes close to the shovellers. This was certainly true in one instance. There is a bank in Tilton that the swallows never occupied except one year when a gang of concreters were there getting out sand and boiling tar.

Family AMPELIDÆ.

Ampelis cedrorum. Cherry Bird.

Cherry Birds are common summer residents, living mostly in flocks, only separating for a few weeks in midsummer to breed. Their spring coming is very uncertain. Sometimes they are here in March, and again, not until May, the date of their appearance depending on the abundance or scarcity of food.

Family LANIIDÆ.

Lanius borealis. Great Northern Shrike.

The Great Northern Shrike is a migrant and occasional winter resident. It is more common near water than on the hills. I twice observed shrikes in Tilton village in January, when the ground was covered with snow. They roosted on the wires over the street, quite undisturbed by the passers beneath them. The song of this shrike is a warble resembling a vireo's in quality.

Lanius ludovicianus. Loggerhead Shrike.

The Loggerhead Shrike is an occasional summer resident. Mr. G. H. Davis of Tilton discovered a nest containing a full set of eggs near his home, in May, 1897. In September of the same year, I observed another specimen in Northfield. These are the only instances of the Loggerhead's appearance here that I can cite.

Family VIREONIDÆ.

Vireo olivaceus. Red-eyed Vireo.

The Red-eyed Vireo is an abundant summer resident, as its nests by every roadside testify. Its stay is from the middle of May till well into September. Besides being pleasing musicians,

Red-eyes are of considerable economic importance, destroying many noxious insects, and among them the hairy caterpillar that infests apple trees.

Vireo gilvus. Warbling Vireo.

The Warbling Vireo is fond of public places, and is oftener found in shade trees of villages and along highways than elsewhere. It is common.

Vireo flavifrons. Yellow-throated Vireo.

The Yellow-throated Vireo is rather rare. But two have come to my notice in ten years.

Vireo solitarius. Blue-headed Vireo.

The Blue-headed Vireo is the earliest arrival of its tribe, coming in April with its voice in tune, though the trees are yet bare, and the nights frosty. It is by no means evenly distributed. It is common in Alton, where I have found nests repeatedly, though about Tilton it is scarce in summer.

Vireo noveboracensis. White-eyed Vireo.

Concerning the White-eyed Vireo, Mr. George Stolworthy writes: "I have found the nest of the white-eyed vireo, which there could be no doubt of, as I stood within five or six feet when the bird left the nest."

Family MNIOTILTIDÆ.

Mniotilta varia. Black and White Creeper.

The Black and White Creeping Warbler is an abundant summer resident, coming about May 1. It favors pine woods, though not exclusively.

Helminthophila ruficapilla. Nashville Warbler.

The Nashville Warbler is rather scarce during the breeding season, though common in migration. A nest of this species, I once saw, was sunk in the ground on a hillside just at the edge of some pine woods, where it was covered by the low outer branches.

Helminthophila peregrina. Tennessee Warbler.

The presence of the Tennessee Warbler is vouched for by Mr. Goodhue.

Compsothlypis americana. Blue Yellow-backed Warbler.

The Blue Yellow-backed Warbler is not very common as a summer resident. The male devotes considerable time to singing, either as he flits about, foraging for his daily sustenance, or from some high perch where his entire attention is devoted

to his vocal efforts. The song, however, is rather a monotonous affair.

Dendroica tigrina. Cape May Warbler.

The Cape May Warbler is included in this list on the authority of Mr. Goodhue. I have never met it.

Dendroica æstiva. Yellow Warbler.

The Summer or Yellow Warbler is an abundant summer resident near ponds and streams, where its sprightly notes and showy plumage are noticeable. Its nest is a downy structure, usually in low bushes, though occasionally in trees.

Dendroica cærulescens. Black-throated Blue Warbler.

The Black-throated Blue Warbler is one of the less common varieties, that keeps pretty closely to the heart of the forest, and thereby escapes the observation of all but inquisitive eyes. I have seen it in the breeding season about the wooded hills of Sanbornton and New Hampton.

Dendroica coronata. Yellow-rumped Warbler.

I have never known the Yellow-rumped Warbler to nest here, though it probably does so now and then. But of all the warbler tribe none are so noticeable in autumn as the Yellow Rumps. From the first days of September till late in October, they swarm over orchards and pastures, and even search the crevices of buildings for hidden morsels. It is a hardy bird, being among the first to appear in spring as well as last to leave in the fall.

Dendroica maculosa. Black-and-Yellow Warbler.

The Black-and-Yellow Warbler breeds here sparingly, being most common during migration. It is a very active species, always on the *qui vive* for an insect, delivering its notes hurriedly, yet with considerable energy. It is usually found in young growth, often near the ground among junipers and small pines.

Dendroica pennsylvanica. Chestnut-sided Warbler.

The Chestnut-sided Warbler is one of our commonest summer resident warblers. It belongs to roadsides, sprout-land, and neglected pastures, oftenest visiting deciduous trees. Its notes are cheerful and sprightly, better than the average of warbler songs. It usually nests in low bushes.

Dendroica castanea. Bay-breasted Warbler.

The Bay-breasted Warbler may be looked for between May 20 and June 1, being one of the latest arrivals in spring, and not a common one. I have never seen it in summer.

Dendroica striata. Black-poll Warbler.

The Black-poll Warbler, another late arrival, is rather common during the last ten days of May and early June, after which it entirely disappears till its return migration early in September.

Dendroica blackburniæ. Blackburnian Warbler.

The Orange-throated or Blackburnian Warbler is a summer resident of regular, though not very common, occurrence. It lives in mixed woods of large growth.

Dendroica virens. Black-throated Green Warbler.

The Black-throated Green Warbler is abundant from about May 1 till October. Its home is in pine woods.

Dendroica vigorsi. Pine-creeping Warbler.

The Pine-creeping Warbler is often the first of its tribe to put in an appearance in spring, though the Yellow-rump sometimes leads. While it is plentiful in migration, it is rather scarce in summer.

Dendroica palmarum hypochrysea. Red-poll Warbler.

The Red-poll or Palm Warbler is another early bird, frequently seen in April and early May. It is much upon the ground, something unusual with warblers, and almost invariably is in open land, or where trees are scattering. The wagging of its tail is a peculiar feature.

Seiurus aurocapillus. Oven Bird.

The Oven Bird is a common and very noisy denizen of all sorts of woods from May 1 till October. It walks instead of hopping like most small birds, and has an independent jerk of its tail which gives it a disdainful aspect, as it parades back and forth on a branch before an intruder. I have seen several nests, and they have all been nicely covered with a roof of dry leaves and small twigs such as cover the ground, so that the mimicry is quite complete.

Seiurus noveboracensis. Water Wagtail.

The Water Wagtail or Water Thrush is a shy citizen of swamps, usually near a body of water. It is tolerably common in its favorite localities, though not often seen.

Geothlypis agilis. Connecticut Warbler.

The Connecticut Warbler is another of Mr. Goodhue's discoveries.

Geothlypis trichas. Maryland Yellow-throat.

The Maryland Yellow-throat is a fussy little individual to be found in almost every brier patch. Its clear ringing song is

buoyant and inspiring. It prefers moist situations, but will go anywhere if there are plenty of bushes.

Sylvania pusilla. Black-capped Warbler.

Wilson's Black-cap or the Black-capped Warbler is among the rarer warblers of this section. It is furnished by Mr. Goodhue.

Sylvania canadensis. Canadian Warbler.

The Canadian Warbler is a summer resident, though it is by no means common. I have seen it here as late as the middle of June, and Mr. Frank Sanders of Sanbornton found it nesting a few years ago near his home.

Setophaga ruticilla. Redstart.

The Redstart is a plentiful species the whole summer through. It inhabits woods, preferring young growth and moist land, where flying insects abound. Nests that I have seen were from three to fifteen feet from the ground, in birches or maples.

Family MOTACILLIDÆ.

Anthus pensilvanicus. Titlark.

Titlarks are visitors for a short time about May 1, and again early in October. They go in flocks almost invariably, and are most noticeable in autumn when they frequent corn fields which have been cleared of their crops.

Family TROGLODYTIDÆ.

Galeoscoptes carolinensis. Cat Bird.

The Cat Bird is a common inhabitant of moist copses and bramble patches, well known as a vocalist. It reaches here about the second week in May and usually disappears in September.

Harporhynchus rufus. Brown Thrasher.

The Brown Thrasher is another well-known singer found in similar situations to the last, though preferring drier ground. Its season here lasts from the first of May till well into October.

Thryothorus bewickii. Bewick's Wren.

I have a Bewick's Wren in my collection that was killed in Alton, April 25, 1890. Late in the fall of the same year, I saw another in a marsh at the head of Suncook pond. This wren is not often found in New Hampshire.

Troglodytes aëdon. House Wren.

The House Wren is very local, and I believe rather rare. Excepting in the neighborhood of Tilton, I have never seen it in any part of this region. Judging from the testimony of elderly

people, I conclude the house wren was formerly more common. The male is a most agreeable singer.

Troglodytes hiemalis. Winter Wren.

The Winter Wren is chiefly a transient, but I have once found it here in nesting season. The song of this wren is a rollicking performance, loud and sweet, quite out of keeping with so tiny a bird.

Family CERTHIIDÆ.

Certhia familiaris americana. Brown Creeper.

The Brown Creeper is a common winter resident, coming in September and lingering till April or May. It is often found in company with chickadees and nuthatches. It has a sprightly little song which resembles its call note, but is louder and consists of several syllables.

Family PARIDÆ.

Sitta carolinensis. White-breasted Nuthatch.

The White-breasted Nuthatch is a resident throughout the year, though apparently here in greater numbers in winter than in summer. It inhabits all sorts of woods, and is frequently seen in orchards. I have seen a nest in a hollow apple tree limb within a few feet of an occupied dwelling.

Sitta canadensis. Red-breasted Nuthatch.

The Red-breasted Nuthatch appears in considerable numbers during the winter, but the majority move northward to breed. A nest that I have seen, and another that has been reported to me, had the entrance surrounded with fresh pitch, plainly to keep out undesirable insect visitors.

Parus atricapillus. Chickadee.

The Chickadee is an abundant resident. Numbers come in winter that do not remain to breed.

Parus hudsonicus. Hudsonian Chickadee.

Mr. Goodhue has a Hudsonian Chickadee in his collection which he found at Webster. Its occurrence so far south is exceptional.

Family SYLVIIDÆ.

Regulus satrapa. Golden-crowned Kinglet.

The Golden-crowned Kinglet is abundant during spring and fall, tolerably common in winter, and occasionally passes the summer here. I found a nest of this kinglet in Alton July 26, 1889. It was pendent like a vireo's, but with much thicker walls, and covered with green moss which harmonized so well with the thick foliage of the spruce branch to which it was attached

that I was only able to discover it by watching the mother carry food to the young ones. It was about eight feet from the ground and near the end of the branch.

Regulus calendula. Ruby-crowned Kinglet.

The Ruby-crowned Kinglet is known here only as a migrant. It is common in the latter part of April and the first week in May, and again in September and October.

Family TURDIDÆ.

Turdus mustelinus. Wood Thrush.

The Wood Thrush is rare so far north as this. It is recorded by Mr. Stolworthy at Franklin.

Turdus fuscescens. Tawny Thrush.

The Tawny Thrush or Veery is common after the first week in May. It prefers damp woods, and is the usual thrush near water.

Turdus ustulatus swainsoni. Olive-backed Thrush.

The Olive-backed Thrush is a migrant, generally considered, though Mr. Stolworthy has once found it nesting in Franklin. It seems to be rather rare even as a transient.

Turdus aonalaschkæ pallasi. Hermit Thrush.

The Hermit Thrush comes early in April and remains till November. It is a common resident, but most plentiful on the hills. This species and the Veery are the only wood thrushes that are at all common.

Merula migratoria. Robin.

The average time of arrival of the Robin is about March 25, and it remains till November. The latter part of its stay is passed in swamps where there are plenty of black alder and mountain ash berries to live upon, and a screen from the prevailing cold winds.

Sialia sialis. Blue Bird.

The Blue Bird vies with the robin as a harbinger of spring. It has modified its early breeding habits somewhat, and now often builds in bird houses, or sometimes in odd crevices about buildings, though the majority still cling to hollow trees and stumps. In 1895 blue birds were very scarce, not more than one pair breeding about Tilton so far as I could discover. The next year there were more, though they were still few; but in 1897 they were as plentiful as ever. The reason assigned for their sudden disappearance was severe weather in the South, which was said to have killed most of them. The sudden increase to normal abundance is rather puzzling, when one considers that ordinarily there is no perceptible increase from year to year.

FIFTEENTH REPORT

(SECOND BIENNIAL)

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF NEW HAMPSHIRE

FOR THE TWO YEARS ENDING NOVEMBER 1, 1898.

MANCHESTER, N. H.
ARTHUR E. CLARKE, PUBLIC PRINTER
1899

STATE OF NEW HAMPSHIRE.

OFFICE OF THE STATE BOARD OF HEALTH,

STATE HOUSE, November 1, 1898.

To His Excellency the Governor and the Honorable Council:

I have the honor to present herewith the fifteenth report of the State Board of Health.

Respectfully submitted.

Irving A. Watson

Secretary.

MEMBERS OF THE BOARD.

Gov. GEORGE A. RAMSDELL . . .	Nashua.
Att'y-Gen. E. G. EASTMAN . . .	Exeter.
G. P. CONN, M. D., *President* . . .	Concord.
C. S. COLLINS, M. D.	Nashua.
ROBERT FLETCHER, C. E.	Hanover.
IRVING A. WATSON, M. D., *Secretary* . .	Concord.

REPORT.

Herewith is presented the fifteenth report of the State Board of Health, the same being the second biennial report, for the fiscal years 1897 and 1898. It is made in accordance with the policy announced in the previous issues, to wit: that the reports should be made a source of sanitary instruction to the people of the state, rather than to encumber them with technical, scientific, and statistical matter, valuable only to those who are making investigations along those lines. We have, therefore, included and discussed matters of general public interest, and have endeavored to make the same as interesting and as plain as possible. Indeed, this report contains less statistical matter than any of the former issues. Those who are especially interested in vital statistical investigations will find every available fact in the Registration Reports. A few statistics are herewith presented that serve to emphasize the need of, or the results of, preventive measures in certain diseases.

The report represents only in a very small degree the actual work of the board, inasmuch as all correspondence, action in certain local cases, etc., etc., is omitted in order to give place to matter of greater public interest.

LOCAL BOARDS OF HEALTH.

The sanitary work throughout the state is accomplished almost entirely through the local boards of health. Under the provisions of the Public Statutes every town has a board of health composed of three members. Some of the cities have under their charters a differently organized health depart-

ment, and in a few instances special precincts, with health officers of their own, have been chartered by the legislature.

The aggregate work done by the local boards of health is very great, and is of vast importance to the physical and material prosperity of the people. Many towns have active, efficient boards, while a few others either do not appreciate the importance of sanitary work, or else do not pay their boards a sufficient amount to allow them to engage in such work to any extent. In not a few towns boards of health are restricted in the performance of their duties as health officers because the town refuses to allow them fair compensation for such work. However, comparing the status of local boards of health today with the boards as they existed ten or fifteen years ago, there has been a wonderful advancement, with equally remarkable results. This is exemplified in every progressive town in the state by improvement in public water supplies, in sewerage, in general cleanliness, in isolation of contagious and infectious diseases, in the better knowledge of disinfection, and above all in the more enlightened understanding by the public as to what sanitation is and its advantages.

The law which was passed a few years ago, making boards of health practically continuous by the appointment of one member annually, the tenure of office being three years, has greatly improved the efficiency of our local boards of health.

NEW HAMPSHIRE ASSOCIATION OF BOARDS OF HEALTH.

Two years ago the state board of health issued a call for a meeting of local health officers, and as a result the New Hampshire Association of Boards of Health was organized October 14, 1896, since which time it has held two meetings annually. At these meetings valuable papers were read, followed by interesting discussions of public health questions, including executive sanitary work by local health officers.

The papers and discussions of the first meeting were published in a little volume entitled, "Transactions of the New Hampshire Association of Boards of Health." During the

past year the papers presented at the meetings of this organization have been printed in the "New Hampshire Sanitary Journal," and the more important ones are included in this report. The latest meeting of the association, convened while this report is in press, was, perhaps, more interesting and important than any hitherto held.

The importance of this association is apparent to all who attend its meetings, and if every health officer in the state would become a member of it, the sanitary service of the state would be greatly improved by the increased knowledge thus acquired.

We commend this organization without hesitancy to the members of all local boards of health, and urge their attendance whenever possible for them to do so.

CONSUMPTION.

It is with pleasure that we are able to announce that the mortality from consumption is being gradually reduced in New Hampshire. In verification of this statement we would call particular attention to the statistics and diagrams presented elsewhere in this report. The death statistics of this disease from 1884 to 1897, inclusive, are given, together with diagrams showing the yearly variations in the mortality, and a considerable diminution in its death rate during the later years of the period under observation.

That consumption is very largely a preventable disease is no longer considered a debatable question. It has been demonstrated beyond controversy, and it is doubtless through a better knowledge of the character of the disease and the importance of sanitation that the decrease in the death rate has been brought about.

Consumption still remains, however, the most fatal disease in the state, and its nature should be understood by every individual. We have in this report given considerable space to this subject, as we have also done in previous reports. Since our last report was published, the board has had printed and distributed several thousand copies of a pamphlet on "The re-

striction and prevention of consumption." (See page 32.) Many boards of health and private individuals have voluntarily assisted in the distribution of this circular. We wish a copy might be placed in the hands of every family in the state. With a proper understanding of the nature of this disease its death rate might, we believe, be reduced to very small proportions compared with the present great mortality.

TYPHOID FEVER.

Typhoid fever is one of the diseases in which sanitary work has wrought a very marked reduction within the past thirty years. Although we have no statistics to show the mortality from this disease a quarter of a century ago, yet the testimony of living physicians who were in practice then, as well as the current literature of the time, is to the effect that it was very much more prevalent then than now.

We have considered this disease elsewhere, and are able to show by actual figures that the death rate is being gradually reduced. A glance at the diagram on page 51 will show the downward tendency of the mortality rates during the past fourteen years,—the result of sanitary work. We have also issued a pamphlet on "The prevention and restriction of typhoid fever," for public distribution. (See page 57.)

OTHER COMMUNICABLE DISEASES.

Elsewhere we give important facts in connection with the mortality from diphtheria and croup, scarlet fever, measles, whooping cough, cholera infantum, pneumonia, bronchitis, and influenza.

The discussion of these various diseases must be considered as authoritative, since it is based upon the actual death returns.

THE REGISTRATION REPORT.

The report of the registration and return of births, marriages, divorces, and deaths is made biennially and contains a large number of statistical tables, in which all the facts con-

nected with the individual return are shown so as to be available for study along any line, special or general, connected with the subject.

The report is not, perhaps, of especial public interest, but as a guide to sanitary work, and in showing the movement of the population of the state, it is invaluable. Without it, it would be impossible to determine many questions relating to public health work which are now definitely settled or indicated by these statistics,—indeed, a health department would be working almost in the dark without mortality statistics to show where sanitary work was most urgently required, as well as the results of such labor.

Through the knowledge conveyed by these reports, we now know just where every death from every known disease occurs; we also know the average annual mortality in the aggregate, and if there is any marked variation from these averages, we know at once that there must be some local cause for it. For instance, if the mortality rate from a given disease in a given locality is in excess of certain averages, we know that there is some local cause for it: that there is urgent need for sanitary work in that locality; that some serious sanitary defect exists.

PRESERVATION OF RECORDS.

Not the least in importance, in connection with the registration of births, marriages, divorces, and deaths, is the personal record. In this department we have at the present time not far from 300,000 individual records of persons who have lived, or are now living, in the state of New Hampshire. These records give the more important historical facts in connection with the individual, such as date of birth, marriage, death, names of parents, residence, occupation, etc., and their preservation is often of importance in the maintenance of legal rights in cases where it becomes necessary to prove a birth, parentage, the marriage, and the death of a person.

Until recently no provision had been made for filing these records so as to make them available for reference, and there has been much complaint in consequence. We are pleased to

announce that suitable filing cases are now being constructed, and that in all probability the records will be in proper shape before the close of another year.

LUNACY.

The State Board of Health constitutes a State Board of Commissioners of Lunacy, which issues a biennial report, embracing a return of commitments, discharges, and deaths at all the institutions in the state in which insane persons are confined.

The most important provision of the law is that which authorizes the board to commit to the New Hampshire Asylum for the Insane, for remedial treatment, such indigent insane persons as, in its judgment, would be benefited by such treatment, the expense being borne by the state. This is a most beneficent law, and embodies a principle which we believe should be carefully maintained by the state. Under it, remedial treatment has been provided for many an unfortunate person to whom it would not otherwise have been possible, and it has also brought inexpressible relief to many families.

The percentage of recoveries, as shown by the several reports of the board, is exceedingly gratifying and fully warrants the expenditure which the state is making in this direction. By an act of the legislature of 1897, a limit of $16,000 was placed upon the appropriation available for the support and remedial treatment of the indigent insane, under the direction of this board. At the present time the board is able, by a careful scrutiny of the cases and the prompt discontinuance of state support at the earliest possible moment, to keep the expenses within the limit prescribed.

The Public Statutes provide that all insane persons who have been supported at the New Hampshire Asylum for the Insane for a period of twenty years, at private expense, shall thereafter be supported at that institution at the expense of the state. There were, at the time the legislature limited the expenditures of the board, twelve such cases, the maintenance of whom was charged to the board of commissioners of lunacy.

Upon presenting the facts to the attorney-general, he decided that such cases were not properly chargeable to this account. Had it not been for the reduction in the number of cases, by reason of the transfer of these twenty-year cases to another account, the sixteen thousand dollars appropriated would not meet the demands upon the board.

During the year just closed, the state paid for the maintenance of the insane committed by order of this board, $15,188.46. The expenses of the commission, including clerical work, printing of blanks, etc., amounted to $604.38. For additional facts in connection with this work, reference may be had to the biennial report of the board.

THE CATTLE COMMISSION.

Since the secretary of the state board of health was, by legislative enactment, made a member of the State Board of Cattle Commissioners, its work may be considered to be closely allied with that of the former. This is particularly true since the chief function of the commission is to prevent the spread of tuberculosis.

The identity of tuberculosis in animals and the same disease in man is fully established, and the fact that the disease in one is communicable to the other makes the work of eradicating tuberculosis in animals of great importance to public health as well as to stock-raisers.

The course pursued by the commission has been a conservative one, in which the general plan has been to destroy only such animals as were found to be tuberculous upon a careful physical examination. The work has been carried on almost wholly by the able and efficient secretary, Hon. N. J. Bachelder, and at an expense, including indemnity for animals destroyed, of but a little more than one half of the available appropriation.

The position taken by the commission with reference to this disease is outlined in a paper in this report, entitled, "Bovine Tuberculosis." For a detailed account of the work of the commission, number of animals destroyed, etc., etc., reference should be had to the biennial report.

SUMMER RESORTS.

The sanitation of summer resort localities is of vast importance to the state of New Hampshire, inasmuch as the income derived from the summer visitor adds very largely to the prosperity of the state, and this cannot be maintained without most careful attention to details,—particularly to the question of public health. This fact is now so well understood by hotel proprietors and others who are seeking and serving the summer visitor, that a careful watch is kept over every avenue through which disease might appear.

From time to time, inspections of the leading summer resort hotels have been made by this board, important improvements suggested and carried out, until today they are, as a whole, in a good sanitary condition. The knowledge that the outbreak of a disease like diphtheria, typhoid fever, or, in fact, any other communicable disease would immediately cause an exodus from the locality, as far as visitors are concerned, has led to a careful supervision to prevent such an event. To provide against such a contingency the services of this board have not infrequently been sought. Elsewhere will be found a report by the president of this board upon a few of our summer resort hotels.

LEGISLATION NEEDED.

First. We believe that the time has arrived when the state should establish and maintain a hygienic laboratory, to be devoted to chemical and bacteriological investigations in the interests of public health, and to protect the people against commercial frauds in the line of food products, etc., which, through the lack of means to enforce the law which we already have upon our statute books, have been thrown upon our markets. We believe the people of the state should be protected against such frauds. A laboratory should be available for such examinations as have been alluded to, and also for the examination of public water supplies, and for the bacteriological diagnosis of diphtheria, typhoid fever, tuberculosis, etc., etc. Such laboratories are now maintained by many

states, and by most of the large cities of the Union. The Vermont legislature has recently appropriated $5,000 to equip a laboratory of this kind, and $8,000 annually for its support.

We are of the opinion that satisfactory work along these lines could be maintained in New Hampshire for an amount somewhat below these figures. We believe the subject is of sufficient importance to the health and commercial interests of the state to receive careful consideration at the hands of the legislature.

Second. Further legislation seems to be necessary for the protection of our public water supplies, particularly where the source, or a part of it, is outside the immediate control of the municipality using it. While there is a general law against the pollution of water used for domestic purposes, it is necessary at times to establish regulations to govern local conditions liable to endanger the water, and this contingency is not sufficiently provided for by statutory law at the present time. To illustrate: Local regulations made by the town of Sunapee, for the protection of Sunapee lake against pollution, can be enforced only within the limits of that town, while similar conditions may exist unrestricted on the shores of the lake in Newbury and New London. This is cited simply as an example. There are other localities in which there is urgent need for some legislation to cover just such a condition as cited above, and which might be met by a carefully prepared bill, embodying specific measures sufficiently exact and stringent to protect any and all public water supplies, or authorizing the State Board of Health to make and cause to be enforced such regulations as it might deem necessary to protect any given supply.

Third. A law should be enacted to regulate the practice of plumbing, to take effect only in such cities and towns as might adopt it. In most towns of the state a law to regulate the practice of plumbing would be totally impracticable and useless; but in some of the cities and larger towns it would be of great advantage and is almost a public necessity. The measure should permit such towns as might adopt it to estab-

lish such rules as would secure good and safe work, thereby reducing to a minimum the great danger to health which results from defective plumbing.

Other measures, bearing to a greater or less extent upon public health matters, will doubtless be presented, but those above alluded to impress us as being of more than ordinary importance.

RAILROAD SANITATION.

Within the past ten years very great improvements have been made by the railroad corporations in the reconstruction of old stations, or building of new ones; in the beautifying of grounds about stations, and in the more careful supervision than heretofore of general sanitary conditions. Each year shows a marked advance in this direction, and it indicates that the managers of our railway systems realize the importance of good sanitation. It has been necessary only to call their attention to sanitary defects to secure prompt action, either by the local agent or by the general management.

Our railway stations and grounds were never before in so good condition as now, and it is a pleasure to announce that the greatest railroad corporation in the state takes a progressive view of the importance of good sanitation, particularly with respect to its bearing upon the summer travel interests of New Hampshire.

SPECIAL PAPERS.

We have included in this report special papers upon different sanitary subjects, all of which we believe to be educational in character and bearing directly upon the public health interests of the state.

All of these papers merit careful reading and study, and in them will be found matters of interest relating to almost every phase of sanitation. While we commend all, we would call especial attention to the article on "Sewerage in Villages," by Prof. William T. Smith, M. D., of Hanover, for the reason that it shows how one village has successfully solved the sew-

erage problem without an appropriation from the town. There are quite a number of villages in New Hampshire in which public sewers are needed, but appropriations cannot be secured at the annual town meetings. We commend a careful consideration of the plan adopted in Hanover to all such localities.

RESTRICTION AND PREVENTION OF CONSUMPTION.

(TUBERCULOSIS.)

Since the demonstration beyond controversy that tuberculosis is a communicable disease and that certain precautions are necessary to restrict if not wholly to eradicate it, much has been written for the purpose of instructing the public in the most effective measures to reduce the prevalence and consequent mortality of this disease.

This board has discussed the subject in several of its latest reports, notably in that of 1895. But we deem it necessary to present the subject still further to the people of New Hampshire, inasmuch as consumption, as is elsewhere shown, is the most fatal disease in the state.

So confident are health authorities that this disease may be very materially reduced, more than twenty state boards of health, as well as the provincial boards of Ontario, Quebec, and New Brunswick, have issued circulars and pamphlets on the restriction and prevention of tuberculosis for distribution among the people. In all that has been written on this subject we have found nothing more to the point than a masterly paper from the pen of James B. Russell, B. A., M. D., LL. D., of Glasgow, Scotland, and from which we herewith present very liberal extracts. This paper has been published for general distribution by the state board of health of Massachusetts. In commenting upon it that board says :

"It is hoped that this paper will tend to quiet unnecessary alarm in relation to the real dangers from the infectious nature of consumption, since, while it shows very conclusively that the disease is infectious, it also shows that, with proper precaution, there is practically no danger from association, even quite intimately, with consumptives."

Tuberculosis in General.

WHAT IS TUBERCULOSIS?

The word tuberculosis, or tuberculous disease, is associated in the popular mind almost exclusively with phthisis or consumption of the lungs. This is by far the most frequent and most deadly form of tuberculosis; but every organ and every tissue of the body may be the seat of tuberculous disease. Hydrocephalus is tubercle in the membranes of the brain; tabes mesenterica is tubercle in the lymphatic glands of the abdomen; scrofula, in the popular sense, is tubercle in the superficial lymphatic glands, most familiar in the neck; lupus is tubercle in the skin; there is tubercle of the joints and of the bones, giving rise to suppurations in all sorts of places, and occasioning surgical operations almost as various in their nature as in their locality.

Tuberculosis is a disease, not only of man, but of the lower animals. No warm-blooded animal is insusceptible when artificially tested, but it occurs naturally with great frequency in those which are domesticated or confined, as the cow, the pig, the rabbit, in fowls, in monkeys, etc.

The only cause of tuberculosis is the tubercle-bacillus. Without the bacillus there can be no tuberculous disease. Therefore, to prevent tuberculosis, we must get rid of the bacillus. From our point of view, tuberculosis is a disease. From the point of view of the bacillus, it is a natural life-process. The bacillus has a plan of life laid down for it, providing, as usual, for the maintenance of the individual and the propagation of its kind. Clearly, it is necessary that we should understand this plan before we can hope to disconcert it. The prevention of tuberculosis rests upon the biology of the bacillus.

THE BIOLOGY OF THE BACILLUS.

The bacillus is not inherited. As regards pulmonary consumption, this statement may be taken as absolutely true. The bacillus *may* pass from a tuberculous parent into the body

of the fœtus, and be born with it; and thus the offspring may carry into independent life a tuberculous process, but this fact has merely an academic interest. Tuberculosis has been actually seen in the fœtus with just sufficient frequency and certainty to prove that the inheritance of the bacillus is not impossible. For all practical purposes, the hygienic administrator is bound to regard *every* case of tuberculosis as caused by infection which has taken place so to speak in the open—within the sphere of his control.

The tubercle-bacillus not being inherited, but passing into the body from the outside, how does it get there? Under what conditions does it exist there? Under what conditions does it pass from the outside to the inside of the body? Under what conditions does it live and propagate there? It is impossible to demarcate the answers to these questions as clearly as the questions themselves. In nature the facts are interlaced, but, at any rate, the questions so stated will promote clear thinking.

The bacillus multiplies by subdivision and by the production of spores. As compared with other disease-producing organisms, it grows very slowly even under the most favorable circumstances. To be effective, therefore, these circumstances must be maintained for weeks continuously. At a temperature of 86° F. growth is much enfeebled, and it entirely ceases below 82.4° F. It cannot grow at a temperature above 107.6° F. It flourishes at the natural deep temperature of the human body, viz., 99° to 100° F.* Moisture is absolutely essential to growth, with a limited supply of air and an absence of light. Obviously, we have here an aggregate of conditions which, in this country at any rate, can only be found in nature *inside the animal body*. The tubercle-bacillus cannot multiply outside the animal body; it can merely live, and live only under certain conditions, and under any conditions only for a limited time. †

When the bacillus obtains access to the body of a warm-blooded animal, which it almost solely does by the great main

* The tubercle-bacillus of fowls has a somewhat wider range of temperature.

† The bacteriologist produces those conditions artificially, and finds it a very difficult task.

entrance, the mouth, passing thence into one or other of the diverging channels, the windpipe and the gullet, it is not yet in a physiological sense inside the body. It must break through the mucous surface of these passages. This is a most important stage in the career of the bacillus from a preventive aspect, which must be dealt with at large further on. Meanwhile, let us assume that the bacillus has broken through, still it has enemies in the tissues and fluids of the body. These also have a supreme interest for us, but these also we shall meanwhile pass by. If every circumstance has proved favorable, the bacillus proceeds *slowly* to multiply, and in doing so to invade and break down the natural tissue around. It may be borne along the stream of lymph or blood, or be carried by wandering cells to other parts of the body. However it may be effected, in all movement the bacillus is passive. Wherever it establishes tuberculosis, the process has products—irritated and disorganized tissue, pus, etc. These products have the relation of foreign bodies to the healthy tissues, and have therefore an eccentric or centrifugal bias. They may, however, be imprisoned and retained, sometimes changed in nature. If the process lies on the line of the great channels by which the bacillus gained entrance, then it has an equally patent exit—in consumption, by the expectoration, or by the fæces, if the expectoration is swallowed. If the process is in the bowel or the kidney, or any organ having a natural exit for its products, then the morbid matter passes out thus. If the process is in bone or in lymphatic glands, or in any locality from which the nearest way outwards is through the skin, then we may have abscesses and a discharge of matter therefrom. To us this is a feature of disease. To the bacillus it is a phase in the cycle of its life. These discharges carry out bacilli and their spores; and these bacilli and their spores maintain the stock of infecting material outside the animal body upon which the continuance of the tubercle-bacillus as an individual and of tuberculosis as a disease depends.

What are the conditions which favor the continued vitality of the bacillus, and preserve the potential activity of its spores

outside the animal body ?* Although the bacillus will not grow, excepting under the conditions of heat and moisture described, it is not killed either by natural cold or heat, or by drying. It is, indeed, one of the hardiest of all disease-producing germs. Freezing has no effect. It resists putrefaction for weeks, and endures in the dry state for months. The greater stability in resisting natural agents and conditions to which other germs speedily succumb is, no doubt, compensatory for the characteristics of parasitism and slow growth. If the bacillus, being unable to grow anywhere but inside a warm-blooded animal, were also unable to survive outside, it would be exterminated. On the other hand, from the animal's point of view, the extremely sluggish growth of the bacillus, and its inability to grow outside, in a measure countervails its tenacity of life, otherwise the animal would be exterminated. Still, in spite of this tenacity of life, the combination of hostile conditions outside the animal body ultimately proves fatal to the bacillus. Direct sunlight will kill the bacillus in a few minutes, and ordinary daylight in a few days, whether it be exposed naked in cultures, or in sputum or in dust, and in each case free flowing air makes the light more active. The converse of these conditions—darkness and stagnant air—favor the bacillus.

Tuberculosis in Man.

Hitherto we have dealt with tuberculosis in its general sense, without reference to the species of the animal in which it is found, or the locality of the body where it is seated. In harmony with the general law of life, the bacillus is varied by the soil in which it grows, and the disease to which it gives rise derives characteristics both as to locality and nature from the physiological idiosyncrasies of the species. For these reasons, and since it is in man that we are *directly* interested, we shall now consider specially *tuberculosis in man.*

* It is impossible to speak separately of the bacilli and their spores. Observations and experiments really refer to the loss or the retention of the property of infectivity.

Putting aside, as of no practical importance, the very rare case of inheritance of the bacillus, man, like other animals, suffers from tuberculosis only when he receives the bacillus from without. Putting also aside, as of no great practical importance from a sanitary aspect, cases which arise from direct inoculation by wounds or through scratches and other ruptures of the integrity of the skin, it may be said that the bacillus always enters by the mouth, that it is either inhaled or swallowed, that it is conveyed either in the air or the food, that it enters either by the lungs or the alimentary canal, or stops short in the structures in and adjacent to the mouth.

Every bacillus and spore thus inhaled or swallowed must have been produced in an animal, not merely derived from or descended from a bacillus or spore produced in an animal, but must itself have passed out from a diseased animal or been included in the flesh derived from a diseased animal.

Tuberculosis in man is therefore caused by infection either (1) through the excretions or discharges from infected animals, including man himself, or (2) the milk of infected animals, including his own species, or (3) the flesh of infected animals.

INFECTION BY SPUTUM AND OTHER DISCHARGES.

There is a remarkable consensus of opinion that persons suffering from phthisis or consumption of the lungs are the largest contributors to the stock of what is very aptly called the "floating infection" which exists in the environs of men. Physicians, bacteriologists, and pathologists, each reasoning on the line of the facts best known to them, concentrate upon this opinion. The hygienist sees no reason to dispute it. Nearly three-fourths of the deaths ascribed to tuberculosis are caused by consumption. * Though the bacillus may reach the lungs by other paths than by the air, still the infection which establishes tuberculosis in the lungs and air passages is generally air-borne. Phthisis is the most frequent cause of phthisis. It is a sufficient cause. Phthisical persons are to be found in every place and in every condition and position in which

* In Glasgow, 1890-94, exactly 73 per cent.

healthy persons are to be found. Everywhere, therefore, tubercle-bacilli may be distributed. For this reason, while all that has been said as to the discharge of bacilli in tuberculosis generally is correct, phthisis has been regarded by all authorities who have taken special steps for the prevention of tuberculosis as either pre-eminently or alone among all its forms demanding precautionary measures. It is necessary, therefore, to enquire exactly how the bacillus is discharged and distributed from a case of phthisis; in what sense phthisis is and in what sense it is not infectious; for a knowledge of the latter is of as much importance as of the former. If we understand how phthisis becomes dangerous, we shall also understand the nature of the risks arising from tuberculosis generally.

The tubercle-bacillus is not "ubiquitous." It haunts the vicinity of the consumptive. It is not in the expired air. It is not in the cutaneous exhalations. It abounds in the sputum. It abounds in the dust of the apartment. It is a well-known physical law that fluid or moist surfaces will not part with solid particles by evaporation or to a current of air. Hence the absence of bacilli in the expired air, and hence they are likewise imprisoned in the sputum. Even particles of sputum sprayed into the air by the violence of coughing, being gross, subside at once, and could only infect if coughed into the face of some one, and mixed with the actually in-going air. In order to be air-borne, the sputum must be dried and broken up into dust. If discharged into a handkerchief, it speedily dries, especially if it is put into the pocket or beneath the pillow. In the last stages of consumption the patient becomes weak, the sputum is expelled imperfectly, pillows, sheets, handkerchiefs are soiled. If a male, the beard or moustache is smeared. Even in the hands of the cleanly, without special precautions, such circumstances all tend to the production around the patient of a halo of infected dust maintained by every process of bedmaking, or of cleaning which includes the pernicious process happily described as "dusting." In the hands of the careless and the dirty, the infectivity is, of

course, greatly aggravated. It attains its maximum of intensity where the filthy habit of spitting on the floor prevails, especially if the floor is carpeted.

The remedy is simply to spit into a spittoon containing a little water; and when a handkerchief must be used, to see that it never dries. Immerse it in water and ultimately boil it. Better still, use a piece of cloth or paper, and burn it at once. Cornet found that where the spittoon was used, and cleanly habits prevailed, there were no bacilli in the dust; where handkerchiefs were used, even though there was no spitting on the floor, there the dust was infective.

This is the golden rule in dealing not only with sputum but with *all* forms of tuberculous discharge, with the fæces when they are infected, the pus from tuberculous sores and abscesses, etc. *Keep them moist.* Especially do not allow any soiled linen or dressings to lie about and dry. Make it impossible for the discharges to pass into the condition of dust.

It is not merely the dried substance of the discharge which determines the bulk of the danger. All dust must be regarded as suspicious in the neighborhood of consumptives. If there is any infection at all about, it is there. The ordinary constituents of dust—the fibres of linen and cotton, the shreds of wool—all act as rafts on which the infective germs are borne about, and with which they rise when disturbed.

The infected dust in apartments occupied or frequented without precautions by consumptives will subside indiscriminately upon any exposed surface, and may thus ultimately be swallowed, *e. g.*, upon plates, cups, glasses, basins, etc., viands of all kinds and fluids, such as milk or water. The latter are the most dangerous. They present more or less moist surfaces. No dust which falls on them can be blown away again, nor can they be cleaned.

The first person to suffer from carelessness with reference to sputum is the patient. He breathes an infected atmosphere, and in the struggle which is going on between his tissues and the bacillus, the latter is constantly reinforced, fresh territory is invaded, and the chance of recovery is destroyed.

Auto-infection is one of the unavoidable risks of phthisis. The chances of this occurring ought not to be knowingly increased. The use or misuse of handkerchiefs, and swallowing the sputum, are both likely occasions. These facts bring the precautions necessary in the public interest within the scope of the duties of the private physician in the treatment of a case of phthisis.

INFECTION BY MILK AND FLESH.

The other sources from which man may derive the infecting bacillus are the milk and the flesh of diseased animals. That infection through the stomach is possible, we know from the observed effect upon consumptives of swallowing their sputum, and from experiments with animals. The process of cooking tends to diminish the risk; but in the case of milk, there is no such safeguard interposed, owing to the habit of the country to consume it raw. The primary seat of tuberculosis in children is so frequently in the bowels and their related glands, and milk forms so large and essential an element in the food of children, that we cannot avoid the conclusion that it is to them a frequent source of infection. There is ample room for public interference to prevent the spread of tuberculosis by meat and milk, but, above all, by milk.

THE CONDITIONS WHICH CONTROL INFECTION.

Although without the bacillus there can be no tuberculosis, we cannot call it the sole cause of the infection in the individual case. The theory of infection has a profound influence upon the practical aspects of prevention. So long as we believe that infection is guided from person to person by supernatural agency, without regard to physical laws, we can do nothing. When we advance to the conception that the infecting element is material, and subject to physical laws, we have taken a great stride towards precision, both in preventing and curing the disease. As we ascertain that the element is solid, then that it is organic, we become more precise, until with the knowledge that infection passes with the body of a microbe,

a minute living being, we are ushered into the study of those complicated conditions which surround the maintenance and development of life.

We have already learned something of the restrictions imposed upon the tubercle-bacillus by some of those conditions. It can grow only within warm-blooded animals. It retains *vitality* with considerable tenacity outside the body, especially when dried, but sunlight, free air, and other natural agents, which first kill and then disintegrate, wage steady war against it. In the long run, therefore, only a fraction of the total quantity of infecting material survives until it has the opportunity to infect.

When at last the bacillus reaches its natural habitat, disease is not necessarily caused thereby. In other words, but a small proportion of all who are exposed to infection, who actually inhale or swallow the bacillus, are infected. Every breath we inhale is loaded with particles of all kinds, organic and inorganic, dead or possessing the potency of life. A large proportion of this microscopic dust is caught in the nasal passages in the case of nose-breathers. Tubercle-bacilli have been found in the discharge from the noses of the attendants in wards occupied by consumptives. The moist lining of the air-passages catches the dust which passes the nose. The breath we exhale is optically pure. There are arrangements for expelling such particles—for scavenging the air-passages. If there were not, our windpipes would get choked as surely as unswept chimneys. What may be called local health is more important as a protection from the tubercle-bacillus than any other of the species of disease-germs, especially the integrity and vigor of the organs by which it enters the body. The bacillus is slow to develop, therefore there is a longer interval for its expulsion; but any catarrh, however local, anything which interposes a mechanical obstruction, or weakens the expelling power, or hampers the movements of the lungs, or provides crevices as resting-places, interferes with the expulsion of the bacillus, as of every other sort of foreign matter. In like manner, any impairment of the functions or integrity

of the stomach or bowels favors infection; but inasmuch as the business of the stomach is to resolve and break up, and its acid juice is inimical, while in the bowels there are swarms of competing microbes, and the struggle for life is keen, the bacillus is more likely to perish in these regions. Still, anything of the nature of indigestion or local irritation may give the microbe a chance.

These are all obstacles to entrance within the substance of the tissues, for, as has already been said, the tubercle-bacillus is no more inside the body after it has passed the portal of the mouth than when it is floating in the dust of the air or in the milk of a tuberculous cow. It is nearer, but *there has been no infection.* When it has effected a lodgment in the tissues, the production of disease depends upon the defeat of the antagonistic forces which surround it. These amount to nothing more than constitutional vigor—tissue-health. A condition of perfect health is one of insusceptibility. In this condition the juices of the tissues are poisonous to microbic life, and their cells active agents of destruction. Depression of vital resistance by disease, debauchery, fatigue, want, even by mental causes, induces susceptibility. Susceptibility may be constitutional, and may be so great and so marked as to amount to a predisposition. This it is which passes by inheritance, and, until the discovery of the bacillus, was regarded as hereditary tuberculosis. It is not the disease which is inherited. It is the predisposition—the feeble constitution, the low vitality, the *tout ensemble* of conditions, some of which are recondite and imperfectly understood, some obvious and capable of specification and comprehension. The outcome is a soil so congenial as to accept a delicate infection, from which the majority of mankind emerges absolutely scathless; a soil which sustains and propagates the bacillus so vigorously that to popular observation the disease seems to be inherited. In such a person a blow or a sprain, a cold or sore throat, determines the local incidence. Nothing shows the reality of the antagonistic forces with which healthy animal tissues are endowed more strikingly than the numerous recoveries which take place,

especially from pulmonary infection. In such cases there has been some temporary local susceptibility; but the vital forces have rallied, have invested the detachments of invaders, have cut off their convoys and scouts, and ultimately starved them out. The fact is undoubted. There is nothing in the world to accomplish this result but the native forces of the tissues. The phrase sounds rather mystical and metaphorical; but the forces are real, and may very confidently be trusted as most important allies in any general campaign against tuberculosis.

In such a contest as that which we have depicted, and alike in both stages, the number of bacilli engaged must obviously have an important relation to the result. It is impossible to express oneself without appealing to the analogies of warfare. In the stage of endeavor to obtain a footing, numbers must tell as effectively as in storming a breach; in the stage of maintaining a footing, as effectively as in the resistance of a garrison or the progress of an invasion. This introduces the all-important preventive doctrine of dilution. Infection is fifty times more likely to occur if there are fifty bacilli in each breath of air or pint of milk than if there is but one. Apart, therefore, altogether from the wholesomeness of ventilation and the vital energy imparted thereby, the merely mechanical effect of diluting or reducing the concentration of infective germs in air has an important protective and preventive power.

What Ought the Local Authorities to Do?

Is tuberculosis an infectious disease?

Now that we have come to the practical issue of this inquiry, it is well at once to raise the question— Is tuberculosis an "infectious disease"? The answer is—Yes and No. It must be apparent from what precedes that, while in the *academic* sense tuberculosis is infectious, in the popular sense it is not. Even in the language of the schools, where words are weighed and meanings are qualified to a nicety, hydrocephalus, although it is tuberculous, cannot in any sense be said to be

infectious; neither can many forms of tuberculosis of glands, bones, and joints. Until a discharge is established, they cannot be infectious. Indeed, it is doubtful if even those cases of miliary tuberculosis of the lungs which have ended in recovery ever were infectious, and it is certain that no case of phthisis is infectious until the expectoration becomes specific. Tuberculosis, therefore, even in an academic sense, is a disease which, though in all cases caused by infection, is not in all cases infectious. There is no other infectious disease of which this can be said. The fact that it is not infectious in the popular sense is of much more importance for our present purpose. The popular idea of an infectious disease is one from which there is no safety save in keeping away from it. Proclaim a disease to be "infectious," and the people will pay no attention to qualifications. It is very natural—don't go near the person, and the conditions of safety need give no trouble! Education makes no difference. The fear of infection is indiscriminating even to absurdity. Enteric fever, scarlet fever, whooping cough, smallpox, all entail the same social ostracism.

There is a substantial excuse for the popular notion of an infectious disease in the fact that the law does not discriminate between one infectious disease and another. The words have a technical meaning, and every disease in the category is within the scope of every provision of the law applicable to infectious disease—compulsory isolation of the living and of the dead, compulsory disinfection, penalties for the use of public vehicles, for appearance in public places, whether streets or buildings, etc., etc. It may be said that the application of these laws is left to the discretion of authorities, which is true; but one has only to study the opinions advanced by some medical officers of health to be convinced that, before placing tuberculosis officially among "infectious diseases," it is necessary to understand quite definitely what is to follow. There is not a single power of interference with the liberty of persons suffering from smallpox, the application of which to consumptives has not been advocated. Indeed, one cannot avoid

contrasting the studied caution and expressed solicitude to protect the consumptive from prejudice, which characterizes the application by the original German investigators of their discoveries to prevention, with the rash utterances of many of those who seek to interpret those discoveries elsewhere. Koch himself showed the example in the closing words of his famous treatise, "It seems to me the time has now come to adopt prophylactic measures against tuberculosis. But, owing to the wide distribution of the disease, all steps taken against it have to deal with social relations, and it must therefore be carefully considered in what way, and how far, we may proceed without neutralizing, by unavoidable disturbances and other disadvantages, the benefit obtained."

Push aside the proposal to extend such demands to everything that can be designated "tuberculosis" as condemned in the utterance. Consider them as applied to consumption alone. Recall all the representatives of that pale multitude one has known who bore the burden of their infirmity for years, few or many, who did good work in the world, earned honest wages, supported themselves, supported others; all those one has heard of who lived more in the world's eye, who have instructed or entertained mankind, consumptives who have enriched our bookshelves, given us paintings for our walls, and satisfied our ears with music; all the phthisical patients to whom Sir Andrew Clark preached from his favorite text—"*Labor vitae vita est*—Work is the life of life," with himself as the example, born of parents who both died of phthisis, and sent to Madeira at twenty-one to die.* They all suffer from an "infectious disease." They are all to be notified by the first physician who sees them. Each is to be "furnished with a card bearing the date of notification," which they are "required to produce on application for disinfectants, etc.," and which medical men, wherever they may have to consult a doctor, are to ask for, so that they may not cause unnecessary expense by being reported again, for economy must not be lost sight of.† The announcement of the sad diagnosis is to be

* "The treatment of Fibroid Lung Disease," a Clinical Lecture.—*Lancet*, 6th January, 1894.

† Dr. Niven "On the Prevention of Phthisis."—*Lancet*, 10th August, 1895.

signalized and proclaimed to the world by a domestic ceremony of purification, conducted by the high priests of the sanitary department, to wipe out all the infection which has followed the unfortunate's pestiferous steps while the taint was yet unrecognized. To put an end to this he must "be thenceforward confined to certain parts of the house," in which the ceremony of purification is to be carried out every two months. They are now known to all men as "consumptive people," and are in future to live up to a code. They must abjure pocket-handkerchiefs; when "attending a workshop, assembly, or church," they must "spit into a hand-glass spittoon," which "may be conveniently attached to the person"; their "eating utensils . . . should be kept separate from all eating utensils of other persons"; their "clothing must be washed separately"; their "bowel discharges should be disinfected."* Even this is a compromise to which the sanitary puritan reconciles himself by the prospect of an ideal such as this: "In the wake of compulsory notification would follow a number of regulations all aiming at stamping out phthisis [surely a misprint for phthisics]. These subsequent regulations fall easily into three classes: (1) Prevention of patients with actual phthisis, or, indeed, with strong hereditary predisposition, from marrying. (2) Prohibition of patients with actual phthisis from frequenting churches, theatres, railway carriages, tram-cars, or any public places. (3) Disinfection of sputa, habitations, and all things coming in contact with phthisical patients. Isolation of the consumptive." †

Let us rapidly run over the various administrative procedures usually applied to infectious diseases, and consider them as applicable to tuberculosis.

* Memorandum of the N. W. Branch of the Society of Medical Officers of Health as to the prevention of phthisis or consumption; also Dr. Niven's Manchester leaflet.

† "The Necessity for placing Tubercular Phthisis under Control."—Article by Arnold Chaplin, M. B., in the *Medical Magazine*, Vol. I., p. 1022. Exactly the same regimen is strenuously advocated in an article in the *Forum* for February, 1894.

COMPULSORY NOTIFICATION ?

Although this has been frequently recommended in expert reports, and was voted by the Parisian Congress in 1888, and again in 1893, as necessary in reference to tuberculosis in general, the fact is chiefly noteworthy as a warning of the direction in which science, without practical discrimination, is moving. This would cover an enlarged cervical gland, a lupus, a white-swelling, a hydrocephalus, a "cold abscess," every form of local tubercle, as well as a case of phthisis. The question has in reality, as a rule, resolved itself into a discussion of the propriety of requiring the notification of consumption. Suffice it to say, that I am not aware of any country or place where this has yet been done. I am not aware of any resolution in favor of compulsory notification having been passed by any body of medical practitioners. On the contrary, the subject has been discussed by the French Academy of Medicine, the College of Physicians of Philadelphia, and the Medical Society of Oldham, with an adverse result. Even the Incorporated Society of Medical Officers of Health of England, when asked to resolve that "tuberculosis should be made a notifiable disease, notifiable under the same acts and under similar conditions to such disease as scarlet fever," passed instead a resolution to the effect that they, "while accepting the view that phthisis is an infective disease, in the prevention of which active hygienic measures should be taken, think it premature to recommend the compulsory notification of a *chronic disease like phthisis.*" At the same time a rider was added encouraging voluntary notification and disinfection. *

ISOLATION ?

Here again it may be mentioned the extremists have proposed that sanitary authorities should provide hospital accommodation for tuberculosis, but practically the question is one of providing for consumption. We must carefully distinguish between the humanitarian and the sanitarian aspect of this question. The conditions which determine infection from

* *Public Health*, September, 1893.

phthisis are, as we have seen, very narrow. With proper precautions, they are obviated merely by sleeping alone. In smallpox and typhus they are so wide as to include almost every case; in scarlet fever they are sufficiently wide to make removal to hospital advisable in three fourths of the cases; and in enteric fever in about the same proportion. From the present point of view, the essentially dangerous case of phthisis is the one which is in the last stage, confined to the house or bedridden. When a person in this condition cannot have a bed alone, especially if young children must share it, when the material accessories of the special precautions necessary are wanting, when the conditions are hygienically bad, then removal would, from a preventive aspect, be useful. But this is a task different from any hitherto undertaken by local authorities, and one not to be lightly assumed—to provide, not a hospital for curative purposes, but a shelter for incurables, a "Friedensheim," or "home of peace," a place in which to die without endangering the living. Consumption hospitals, in the ordinary sense, are not open to such cases. I confess to considerable sympathy with the opinion of Dr. Squire,* referring to this limited class of cases—"A sanitary district should provide a home for its own advanced consumptives, where the sufferers should be received, without thereby incurring the brand of pauperism; these invalids would thus be prevented from being unwilling dangers to others." At all events, any provision which exists for the treatment of consumption ought to be patronized by the authorities. These doctrines give them a special interest in consumptives.

DISINFECTION ?

We already, when asked by medical practitioners, wash and disinfect after fatal cases of phthisis, but we seldom are asked.

The circumstances which require precautions in carrying out the washings of consumptives or other persons having tuberculous discharges are restricted very much in comparison with the ordinary infectious diseases. Indeed, we must avoid

* "The Hygienic Prevention of Consumption," 1893, p. 141.

creating the impression that the bedding and clothing are necessarily infected. It is not so. They seldom are infected. It is the helplessness or carelessness of the patient which leads to infection of his garments, etc. Here again the advanced case, the fatal case, is the dangerous one; so that it would be well that washing and disinfection should, *always after death*, be undertaken by the authorities. If people possess the means of washing properly the clothing of the healthy members of their household, they can also wash the ordinary linen of a consumptive. I see no reason for interference even in the use of a common washing-house. If, however, people have not the requisite accommodation and appliances, if they are untidy and cannot be trusted to carry out any process of washing at all, then it might be carried out by the authorities, each case being considered in view of the circumstances. Whatever danger there is in any case emerges not from mere neighborhood or to mere touching of articles, or from the act of washing, but from the disturbance of dust when they are dry. The moment they are wet the risk is gone.

POPULAR INSTRUCTION ?

In Glasgow, for the last twenty years, the local authority has caused a paper, couched in simple language, entitled "Hints about the Prevention of Scarlet Fever," to be left at every house in which a case is known to exist. While it would be well to take similar means for the instruction of the people regarding tuberculosis, the dissemination of the knowledge of the facts we have been considering through the mass of the public must depend chiefly upon the medical profession. No doubt, every case of consumption will be made the occasion of some detailed instructions as to the nature of the risks entailed upon the family, and the method of obviating them. But there is room and use for popular instructions applicable to the special risks of consumption and of strumous sores. These might be supplied to public dispensaries, and given there to the appropriate patients; and, no doubt, many practitioners would welcome such papers for the more speedy and certain

information of private patients. What ought to be in such pamphlets? We certainly do not wish any exposition of the whole etiology of tuberculosis. We do not wish to call names, and to run the risk of false impressions therefrom. We would meet the occasion of a case of consumption or a case of open tuberculous sores, and state as plainly as might be under what conditions the patients may live in the family, and follow the ordinary intercourses of life, without causing risk to anybody. We would preach the gospel of cleanliness, fresh air, and sunshine, from a new text.

I have already remarked upon the tendency of the disciples of Koch, Cornet, and Heller, especially in this country, to out-Herod Herod in the application of their doctrines. One naturally looks to Cornet himself and to the city where he resides, where, in fact, the bacillus was discovered, and whence nearly all we know of it has been announced to the world, for guidance as to what it is expedient to teach the people as to consumption, and what it is necessary to require of consumptives by way of precaution for the safety of others. Here are (1) a leaflet which Cornet is in the habit of giving to his patients; and (2) a leaflet issued by the municipal authorities of Berlin :—

I.—Cornet.

PROTECTION FROM CONSUMPTION.*

The most destructive disease of the human race is consumption (tuberculosis). It carries off a seventh of the population. In Germany alone there die yearly of consumption well nigh one hundred and fifty thousand people.

It has now been discovered that this disease is caused by the inhalation of a germ, a so-called bacillus. It is infectious, that is, it can be given by any person to another. But neither the breath nor the perspiration of the patient is at all dangerous, as used to be supposed. Infection generally takes place through the spit, and, according to the latest inquiries, especially when the spit is discharged by the consumptive upon the floor or in a handkerchief, where it dries and becomes dust,

* "Ueber Tuberculose," etc., etc., von Dr. Georg Cornet, Leipzig, 1890, p. 145.

and some of the swarm of germs contained therein are inhaled by healthy people.

Many other diseases, such as diphtheria, pneumonia, and various forms of catarrh, may be communicated in a similar way.

Consumptives endanger not only those about them, but themselves, through the drying of their spit, because they again inhale the discharged and dried bacilli, and thus infect hitherto sound parts of their lungs.

Such infection may be avoided if consumptives, and, indeed, all who have a chronic cough with expectoration, keep this expectoration always moist; if they give up spitting on the floor or into a handkerchief, and always use a spittoon which is emptied down the water-closet.

Spittoons must be placed wherever it appears necessary, in every enclosed space frequented by men. They ought not to be filled with sand or sawdust, but either left entirely empty or supplied with a very little water. They ought to be at hand in sufficient numbers in every apartment of houses, in workshops and factories, in counting-houses, schools, offices, public places, in corridors and on stairs, so as to give every one a convenient opportunity of observing these injunctions.

In this way healthy people who have to remain within the same room as consumptives will be almost entirely protected from infection.

Posters ought to be put up in factories, work places, etc., forbidding most strictly spitting upon the floor or into a handkerchief.

On the street, where spitting can scarcely be prevented, certain other circumstances diminish the risk of infection.

Let every man, even though suffering from an ordinary cough, discharge his spit, not on the ground, nor in a pocket-handkerchief, but always in a spittoon.

Milk ought, as far as possible, to be used only after boiling, especially by children, invalids, and convalescents.

By the strict observance of these injunctions, consumptives are made almost harmless to those about them; and all the more that the bacilli can live outside the body only for about six months. It may be hoped that, if these rules are followed out by the sick, consumption in general will diminish.

II.—Berlin.

Measures against the Spread of Consumption.

Pulmonary and laryngeal consumption (tuberculosis) is communicated to the healthy by means of the tubercle-bacilli contained in the expectoration of the sick, when the spit dries, becomes dust, and is thus inhaled. The discharges from the bowels of such persons may in like manner act injuriously.

If those matters are rendered harmless, the spread of consumption is prevented; the healthy are protected from the sick.

In order to prevent drying and the production of dust, the consumptive, indeed *every* person who has a cough (people with a cough are often not aware that they are actually coughing up tubercle-bacilli), ought to spit in vessels containing a little water (spittoons of earthenware or glass). No person ought ever to spit upon the floor or into a pocket-handkerchief. For the reception of sputum, spittoons should be placed in the dwellings of all who are ill with a cough, and, indeed, in all houses, on the stair landings, but especially in such buildings and rooms as are used by the public (hotels, restaurants, places of amusement, meeting places of all kinds, schools, etc.). These spittoons should be eight to ten inches in diameter, two inches in height, with *smooth* slightly inverted edges, made of strong, *smooth* glass, porcelain, earthenware, or enameled iron, containing water to the depth of half an inch or thereby. In place of public resort there should be a clearly legible inscription on the wall "*Spittoon for the use of persons troubled with cough.*" The water must be renewed as it evaporates; the spittoons to be emptied down the water-closet, and washed daily with boiling water.

Cleanliness of all places is *the first condition* of a *successful* public health administration; consumptives ought *especially* to study cleanliness.

The sitting and sleeping rooms of consumptives ought to be provided with washable curtains, table covers, etc., with no carpets on the floors, or woollen runners on the stairs, and contain as little furniture as possible, with washable, easily removable covers (dusters). Elastic iron garden seats, with washable covers or movable cushions, are the most suitable furniture, and facilitate cleaning and disinfection of the room and its contents. Bedmats should be made of washable jute material.

Wipe the *whole* floor of every room over with a damp cloth daily to remove the dust, and even in winter ventilate thor-

oughly for *at least* an hour. The room should be thoroughly cleaned weekly, and every three months be disinfected, according to the directions of the Code of 7th February, 1887, prescribing the process of disinfection in epidemic disease. The fulfilment of these instructions, especially the harmless removal of the expectoration, enables the intercourse of the healthy with consumptives to be carried on without scruple, and prevents the spread of this most destructive disease.

May everybody, according to his circumstances, co-operate to this end.

It is characteristic of all official action in Germany in relation to the person of the consumptive to concentrate attention upon his expectoration. Every detail of injunction, as well as express statement, has the effect of liberating the consumptive from all social disability, so long as he is able to go about, *provided* he is careful to follow the simplest precautions as to expectoration; and when he is weak and bedridden, *provided* his attendants take up the *rôle* as to expectoration and are cleanly as to his other discharges. It is the same in France. Out of the periodic "Congress for the Study of Tuberculosis," sprang a "League for the Prevention of Pulmonary Phthisis and other forms of Tuberculosis," the primary object of which was to educate the people of France by the circulation of popular literature, each member acting as a distributing center in his own locality. Their first issue was the code of instructions which received such drastic treatment at the hands of the Royal Academy. This was included in a pamphlet of twelve pages, which has been scattered broadcast over France. The code itself is prefaced by some facts to show the gravity of phthisis as a cause of ill health and death, and by an exposition of the modern doctrine, in the course of which this sentence is printed in emphatic type :—

We know further that the consumptive is not in the least dangerous by contact or proximity, that it is neither his body nor his breath which is hurtful, and that we can chat with him for hours, live with him for years, and even sleep in his room and give him the most constant care, without running any serious risk, *provided we take certain precautions*, the chief of which is to collect his expectoration, and not to delay the destruction of his spittle until it becomes dry, and is disseminated as dust into the atmosphere.

This position is logical and unassailable. If you accept the doctrine as sound, the practice must be conceded as sufficient. Let there be spittoons handy for everybody: don't put your spit in the way of drying and becoming dust; don't anywhere stir up the dust in inclosed places. The remedy is so commonplace that, after reading all that has been written and spoken, and proclaimed and enjoined, when we look at our notes and find nothing but sputum, spittoons, and dust, we are apt to show a little temper, like Naaman when he expected the prophet to hold a solemn function over his leprosy, and he merely told him to go and wash himself. No doubt, the very simplicity of the prescription will constitute the greatest difficulty in the way of its acceptance and observance. To the vulgar a "spittle" is symbolic of all that is insignificant and contemptible. To base a cardinal matter of sanitary practice and regulation upon the how, and the when, and the where, people are to spit, requires some moral courage. Only a clear apprehension of, and firm belief in, the doctrine that practically consumption is communicable through dried expectoration, and nothing else, will save the practice from ridicule.

How far it is to be explained by the fear of this—how far by the imposition of modern doctrines upon the top of the conception of a vague infection, instead of entirely substituting the one for the other—we cannot say; but the fact remains that in this country the advocates of the modern doctrines never seem to regard the consumptive with any more equanimity. They expound the *modus operandi* of infection; they prescribe spittoons and proscribe dust, just as is done on the continent; but in place of manifesting confidence in the consumptive thus reformed in his habits, as they most expressly do abroad, the tendency here is to exhibit suspicion of him in all his ways They would surround him with restrictions, and cover him with differential marks, which must make him almost as conspicuous in society as if he were clad in the gray gown and sounded the clapper of a mediæval leper—

> "They curse him in eating, they curse him in drinking,
> They curse him in coughing, in sneezing, in winking."

The jackdaw of Rheims was not "a penny the worse," but it would be far otherwise with the poor consumptive. Well may one say, "Show us your faith by your works"; but it is not the logical inconsistency, it is the cruelty, the inexpediency of these restrictions which moves our criticism. They are cruel and inexpedient, because unnecessary. They deprive the consumptive of the very advantage of the modern doctrine to which Cornet never tires of adverting, "The consumptive in himself is almost absolutely harmless, and only becomes harmful through bad habits." Setting out from this proposition, he says, prophylaxis is therefore simple. No more demands for legislative prohibition of marriage and other absurdities of restriction, which would consign consumptives to an island in the solitary ocean. No more demands for the separation of children from tuberculous parents, for their accommodation in institutions, for abstinence from kissing them,* for avoidance of intercourse with consumptives, for exclusion of consumptive workmen from workshops, etc. Cornet thinks such prescriptions about the furnishing of rooms for consumptives as those in the Berlin leaflet, and as to special disinfection of sputum are futile for private houses; the hygienist must endeavor to make his demands consistent with the comforts and habits of civilized life, otherwise his voice will be as that of one crying in the wilderness. This is now possible. Prophylaxis had of late come to a standstill because of its impracticable demands. Koch's discovery, the most fruitful in medicine, seemed to exhaust itself in staining bacilli.† In short, Cornet has proved by experimental induction, if ever anything has been proved, that the sputum is practically the only source of infection in phthisis; that where there is no sputum there is no infection; that the sputum is not infectious unless it dries; that it cannot dry excepting under certain conditions, perfectly easy to be avoided; that if these conditions are avoided, a consumptive is not a source of danger to any

* He means kissing on the cheek or brow, which he advises in place of osculation.

† Ueber Tuberculose, etc.," 1890, pp. 130, *et seq.* He recurs to the same subject in his paper, "Die Prophylaxis der Tuberculose, etc."—*Berliner klin. Woch*, May, 1895.

one in the ordinary intercourse of society and the home. If this is so, we must say so; and we must not act, or make others act, as if we did not believe it.

TUBERCULOUS MILK.

There is no need for argument in reference to the milk of tuberculous cows. The facts are so universally accepted and so grave, that the administrative effect shines through them. It is precisely the Glasgow position—that a tuberculous cow must not be retained in a dairy. There is a remarkable consensus of opinion as to the influence of milk in disseminating tuberculosis, especially amongst the young. The pathologist finds "that of the total deaths under ten years of age amongst the mass of the people, about a third are due to tuberculosis,"* and that the usual seat of the disease at that age points to food as the medium of infection. The prevalence of tuberculosis among dairy cows is notorious. Experiment shows that when the udder is affected the milk is virulent. Every authority on the prophylaxis of tuberculosis places the supervision of the milk supply next to the regulation of the expectoration of consumptives in importance. I am inclined to think that it is at least of equivalent importance. It certainly is much more practicable as a matter of sanitary administration. If we remember the habits of the tubercle-bacillus, we cannot imagine a more favorable nurture-ground than the typical byre (cow stable)—a dark or badly lighted space, with insufficient ventilating apertures, which are unhesitatingly closed when necessary to maintain a temperature of 60° to 70° F. by the heat of the animals; the air consequently loaded with carbonic acid, with organic impurities and moisture, full of the dust of dried dung, never penetrated by a direct ray of sunlight, in winter never vacated either in country or town for weeks, and in cities never vacated at all.† The natural result

* "Tuberculosis viewed as an Infectious Disease; its Prevalence and the Frequency of Recovery from it."—Professor Joseph Coats, *Sanitary Journal*, 23d November, 1891.

† See valuable paper by J. MacMillan, M. B., M. Sc., Edinburgh, "An Investigation into the Condition of the Atmosphere of Cowhouses and Stables in Edinburgh, Leith, and the County of Midlothian."—*Journal of Comparative Pathology and Therapeutics*, 1892.

is that dairy stock is ravaged with tuberculosis. Yet we never hear a farmer or a dairyman speak of tuberculosis without speaking of compensation. When he puts windows in his byre, and floods it with light, ventilates it, and ceases to use his cow as a heating apparatus, it will be time enough to speak of compensation. Meanwhile the children of the town are being infected wholesale, and it behooves the authorities, not only to take every means to eliminate tuberculous cows from dairy byres, but to enforce sanitary reform in the construction, use, and condition of byres. By-laws as to cubic space, ventilation, lighting, cleanliness, obtain from tuberculosis a direct interest to all men.

But yet more is required. A competent veterinary inspector ought to be at once appointed, who could test with tuberculin the accuracy of the suspicions suggested by his skilled general examination. In this way only can we hope to detect and abolish, as milk-producers, animals which are, no doubt, at this moment contaminating the milk supply of Glasgow. At present our powers are lying dormant. After putting our own house in order, an occasional inspection of the cattle at dairy farms, chosen at random in various parts of the country, would have a most wholesome effect, not limited to the detection of a few unsound animals, but leading up to more stringent by-laws and better sanitation in country byres. County officials require a little help from the powerful commercial lever which the purchaser of country produce can apply whenever he chooses.

THE DWELLING AND CONSUMPTION.

We have already gone with some detail into the relation of local and general health to tuberculosis through their influence on the bacillus. Everything within the control of the individual which promotes and maintains soundness of body; everything within the control of the municipality or the state which improves the physical conditions beyond which the individual living in populous communities cannot go, which raises and maintains the standard of public health, comes within the

scope of the prevention of tuberculosis. So that, to treat this aspect of prevention in its fullness, would be to write a treatise on private regimen and state medicine. Nevertheless, there are some of the elements of health which tuberculosis marks with special importance.

A copious supply of pure air and distribution of direct and diffused sunlight within and without the dwelling are not only wholesome to man, but are directly fatal to the bacilli distributed outside the animal body. Sunlight is the only disinfectant which sustains the man while it kills the microbe. Therefore, whatever withdraws from the air we breathe impurity of smoke, or dust, or foul exhalation, and from the sky above us that canopy of smoke which reduces our sunshine to twilight; everything which promotes free motion of air without and within the house; every by-law which regulates the width of streets, the height of houses, the arrangement of buildings, so as to offer no obstruction to the winds, and to secure as much light and as little shadow in the hours of daylight as possible, which promotes the access of the sun's rays to dwellings, and helps to make the sky visible from the floor of all inhabited rooms, which widens and brightens lobbies and staircases in tenements, which prevents dampness of foundations and walls; every regulation which checks overcrowding both in house and work place, which protects the artificer from irritating dust and fumes and secures to workers of every degree and kind natural light and pure air in the place of their employment,—all are precautions against tuberculosis.

The lungs are like every other organ, their health is promoted by free and full use. Deep inhalation of pure air—especially the open air, the air which is moving freely in the great currents we call winds, which is clarified by sunshine—gives vigor to the lungs, and supplies the heart with well oxygenated blood to be sent throughout the body, increasing the insusceptibility of every tissue. Therefore, every public park, and the flowers and music which attract people thither, every open space and children's playground, every cricket and football field, every gymnasium and drill-ground, is a precaution against consumption.

It is remarkable with what unanimity those who have studied consumption clinically testify that no diseases predispose to it more frequently than enteric fever, scarlet fever, measles and whooping-cough. Enteric fever produces a profound and long-continued depression of the vitality, which favors the lodgment of the bacillus. If, perchance, tuberculous milk should be given to such patients, who are practically sustained for weeks on milk and nothing else, it certainly would infect. Scarlet fever, in its severer forms, also reduces constitutional resistance. On the other hand, measles and whooping-cough create for the bacillus an opportunity chiefly by their influence on local health, producing debility in the lungs, to which whooping-cough frequently adds great general exhaustion. It follows from these facts that all hygienic measures which tend to prevent enteric fever, and whatever is done to limit the spread and prevent the complications of the infectious diseases of children, are precautions against consumption.

In combating tuberculosis in the lower animals, hygienic measures bear an equally important part. Indeed, the tuberculosis of animals is begotten of the domestication of animals by man, and the perversity of man in treating them as if fresh air and sunlight were less essential to their health than to his own. The fact is they are more essential. Tuberculosis prevails among the different species in proportion to the extent to which man has, for his purposes, made them denizens of closed spaces; and most of all in the cow, which he has entirely taken possession of, and which he treats as if foul air and darkness were conditions of its being. Dogs and cats also share in the risks of the society of consumptives who are careless in their habits. The improvement of the hygiene of the domestic animals is a precaution against consumption in man.

Summary of Suggestions.

1. It is of supreme importance, first of all, to lay in the mind, both of the profession and the public, a broad foundation of positive knowledge. The direct and indirect practical issues of the doctrine of tuberculosis are very various, and can

only be effectively worked out through the intelligence of the community. They touch the business of administrative bodies of every kind, not merely municipal, but parochial, charitable, corrective, educational, and others both of a public and private character. They affect the personal habits of a considerable proportion of the citizens, and the duties of those about them, and, in certain circumstances, are responsible for them. They concern the health of all.

2. The local authority ought to resolve that, in the interests of public health, it is necessary that washing and disinfection should be effectively carried out after every death from pulmonary consumption, and at the discretion of the medical officers in the course of illness from this or any other form of tuberculous disease.

3. In my own opinion, the importance of taking immediate action in the direction of eliminating tuberculous cows from the dairies, first of all in Glasgow, and next from those sending milk into Glasgow, can scarcely be exaggerated. It is at least equivalent in promise of beneficial results to any part of the special action recommended in this report. Glasgow is in the unusual position of possessing ready to hand the legal powers to deal with this source of tuberculosis. We cannot take full advantage of these powers without a veterinary expert. Science has provided in tuberculin a test which overcomes that difficulty of diagnosis of tuberculous disease in the living animal which has hitherto made professional opinion uncertain or only equivalent to suspicion, and therefore insufficient to support decisive action. This test can be systematically applied only by a specially qualified veterinary surgeon.

4. The issuing of popular leaflets to be systematically distributed from house to house, and otherwise put into the hands of those responsible for the care of the sick, may be remitted to the medical officers to be taken in due course.

5. It is scarcely necessary to point out that many departments of municipal management ought to be inspired with renewed energy, and to receive increased precision of direction,

each in its own special work, from this doctrine of tuberculosis, *e. g.* :—

In the application of general and local powers to the suppression of damp, dark dwelling-houses; to the dissemination of light and air within and around tenements and work places, whether factories, workshops, warehouses, counting-houses, or offices; in the enforcement of ventilation, light and cleanliness in byres; in the provision of open spaces and play places convenient to tenements.

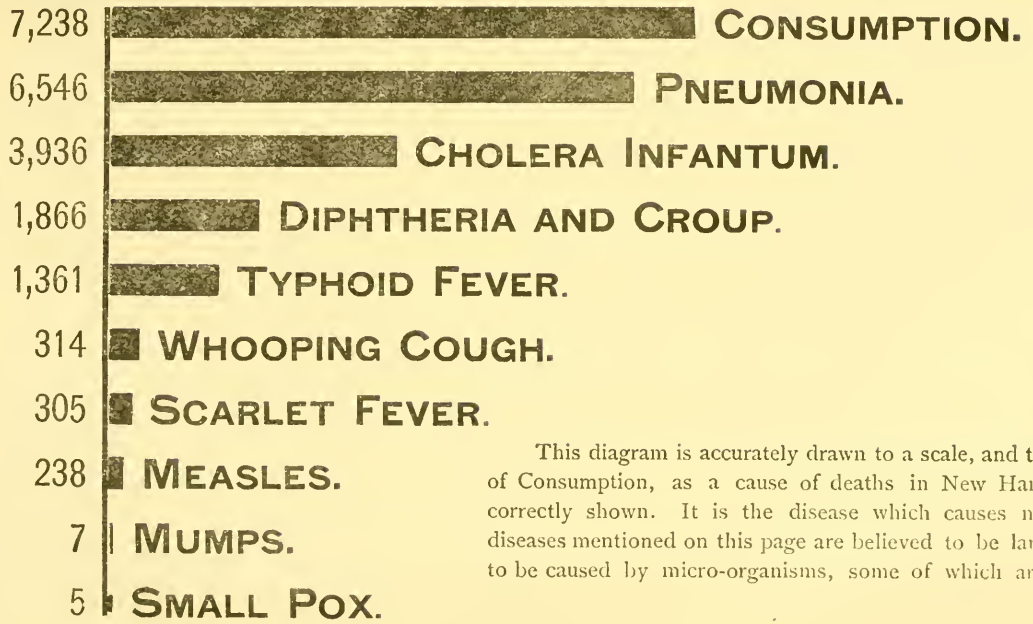
In the suppression of smoke, and the energetic application of the law in all cases relating to overcrowding, cleanliness of the house, and other matters of domestic police, which, if not associated in the judicial mind with some large principle, are apt to sink to the rank of petty details, rather vexatious than otherwise.

Parks are only useful in proportion as they are used, and therefore they must be made attractive. Flowers are wanted for some, music for others, but always space for the young. The youthful instinct to play and sport is accessory to growth and development, and suitable space for the gratification of that instinct may powerfully aid in building up strong, resistant constitutions.

The superintendents of railways, especially of street lines, may find moral courage to enforce their by-laws against spitting "in or upon any car," which, in fact, means to compel the male sex to refrain, for hygienic reasons, from doing that which the female sex, from a sense of propriety, never does.

6. The practical issues of this doctrine of tuberculosis, as regards the individual and the family, in matters which can only be touched by private effort, actuated by the growth of intelligence, are many and various, and must be trusted to the evolution of thought in the process of time. How to deal with *domestic dust* is, perhaps, the most important of these issues. It is to be desired that women should understand the importance of dust in the causation of consumption, and should devise methods of dealing with dust which will end in its collection and destruction, not merely in its disturbance and redistribution. Not merely as housewives, but as sick nurses, women ought to study these modern doctrines.

Deaths in New Hampshire 1887-1896. Ten Years.



This diagram is accurately drawn to a scale, and the *relative importance* of Consumption, as a cause of deaths in New Hampshire, is, therefore, correctly shown. It is the disease which causes most deaths. All the diseases mentioned on this page are believed to be largely preventable, and to be caused by micro-organisms, some of which are well known.

RESTRICTION AND PREVENTION OF CONSUMPTION.

ISSUED BY THE STATE BOARD OF HEALTH OF NEW HAMPSHIRE.

CONSUMPTION, FATALITY OF.

Consumption is the most fatal disease known to civilization. In New Hampshire it is first among the causes of death. The diagram on the opposite page shows its relative position to the chief infectious and contagious diseases in point of fatality.

The number of deaths returned under this head during the past ten years in New Hampshire was 7,238, an average rate of 723.8 annually. If to this were added the deaths from tuberculosis returned under other terms, the death-rate from this disease in this state would probably exceed 1,000 persons yearly.

A large part of this great mortality can and ought to be prevented. Consumption, although largely preventable, like other communicable diseases, causes in New Hampshire more than one thousand times as many deaths as smallpox, yet a single case of the latter disease will arouse a whole community, while the presence of the former in probably every town in the state, does not cause the least excitement or any concerted action to restrict its insidious and fearful ravages.

CONSUMPTION DEFINED.

Consumption (more properly called tuberculosis), is generally looked upon by the public as a wasting disease, the seat of which is in the lungs, and which in this form is sometimes called "tuberculosis," "phthisis," "phthisis pulmonalis," "tubercular consumption," or "pulmonary consumption." It is as a disease of the lungs best known in all communities, and as such appears in its most frequent and fatal form; but every organ and tissue of the body may be the seat of tubercular disease, as, for instance, in "tubercular meningitis" (acute hydrocephalus of the membrane of the brain), "tabes mesenterica"

of the lymphatic glands of the abdomen, "scrofula," as is commonly seen in the lymphatic glands of the neck, "lupus" of the skin, "white swelling" of the joints, as well as in other tuberculous conditions well known to physicians and surgeons.

CAUSE OF CONSUMPTION.

Consumption is caused by a germ known as the "tubercle bacillus," and without this germ there can be no consumption or other form of tubercular disease. Therefore, to prevent consumption, we must get rid of, or keep out of the way of, this bacillus. This germ is not inherited, but is always contracted from some other case, either human or animal, and with the rarer exception of surface infection, the germ must be inhaled or swallowed in order to produce the disease. It is calculated that about three-fourths of the deaths from tuberculosis are caused by consumption of the lungs, therefore it is evident that the disease is most frequently contracted by the inhalation of the germ.

HOW COMMUNICATED.

The disease is chiefly communicated by the dried sputa of consumptives. This may be readily understood, when it is known that the sputum of a consumptive patient contains thousands, and probably millions, of the germs, and through the perhaps thoughtless habit of expectorating in the public streets, highways, about the premises, or even depositing the sputum in their own apartments in such a way that it becomes dried before being taken care of, the germs are disseminated in the atmosphere. After the sputum has become dried, a current of air, the trailing of skirts, or the act of sweeping sidewalks, stores, halls, factories, private apartments, and in fact, all places where sputa may have been deposited, diffuses the germs through the atmosphere, and thus are created the best possible conditions for infection.

HOW PREVENTED.

It is evident, that the most positive preventive of consumption is the destruction of all tuberculous sputum before it has

becomed dried, or, in other words, before the seeds of the disease can be scattered broadcast. This is necessary for the purpose of protecting, not only the community and the family, but also the patient himself from possible re-infection.

The necessary precautions any tuberculous patient can take with but very little effort, and they will effectually prevent his communicating the disease to others or re-infecting himself. All persons who have a cough, and who expectorate to any extent, should observe the same precautions, even though they may not have been pronounced tuberculous, for it is possible that they may be in the early stages of the disease.

Rules to be Observed.

No consumptive should expectorate upon sidewalks, floors of rooms, public halls, railway cars or other vehicles, or in any other place where the sputa, when dried, will be a source of danger. Cuspidores in hotels and other public places, and in rooms occupied or used by consumptives, should always contain a little water, or, better still, a disinfecting solution.*

At home, expectorate into a cup kept for that purpose, in which there is a disinfecting solution; burn contents, and boil cup.

Never expectorate into a pocket handkerchief or cloth which will be allowed to dry. Immerse handkerchiefs in boiling water before storing them with the soiled linen.

For use upon the streets or when away from home, thin Japanese napkins may be provided. After using, they should be folded and burned at the first opportunity.†

Do not spit where domestic animals can have access to this matter. Cattle and fowls are susceptible, and become in turn sources of infection. In fact, do not spit at all where sputum cannot be destroyed before it can dry.

Do not spit on streets, and never swallow the sputum.

No tuberculous person should kiss any one on the mouth.

* For this solution one part of carbolic acid crystals to about five parts of water may be used, or one part corrosive sublimate to one thousand parts of water. The latter solution is odorless, and for that reason is in some instances preferable. Both solutions are poisonous taken internally.

† These napkins can be had at about one dollar per thousand.

Tuberculous patients should be smooth shaven. It is impossible to keep a beard clean and from being infected.

The tuberculous must always sleep alone.

All bed clothing should be changed often, every day when the case is far advanced (no puffs or comforters should be used on the bed), and should be at once immersed in boiling water for five minutes.

Have separate table utensils, and cause them to be scalded as soon as used.

A tuberculous mother must not nurse her baby, nor kiss it on the mouth, and in preparing its food must observe special care.

Tuberculous persons should not engage in occupations where they are compelled to handle food products, as in bakeries, etc.

Be careful not to infect the sleeping berths when traveling.

A FEW DIRECTIONS TO THOSE WHO WOULD AVOID CONTRACTING THE DISEASE.

Remember the sources of infection: Sputum, bowel discharges, and pus from abscesses or tuberculous surfaces.

Avoid resorts devoted to the treatment of the tuberculous.

Summer and winter, women should wear skirts that clear the walks by several inches. Avoid all kinds of fur or other soft trimmings around the lower border of skirts. All the laws that can be enacted, and all the good advice that may be offered, will serve only to diminish, but will not eradicate, this almost universal practice of spitting. Note the filth, especially the sputum on the sidewalks. Skirts dragged through this, are taken home, dried, brushed, and cleaned, and thus infection is introduced into the household.

Do not move into a house where the last occupant was tuberculous, without an effective disinfection of the premises.

Do not share a consumptive's bed, nor use the personal property, including dishes, belonging to one.

GENERAL PREVENTIVE MEASURES.

Under this head are to be included all those conditions and requirements necessary to maintain the highest standard of physical vigor, and almost everything that comes under general sanitation.

Dampness of the soil upon which the house stands and dampness of the immediate locality are to be avoided.

A pure water supply is essential. Water from wells near privies, sink drains, barnyards, etc., should be looked upon with great suspicion at least.

Adequate ventilation should be provided for all almshouses, halls, schoolhouses, and other buildings where people assemble in considerable numbers. Sleeping-rooms should always be well ventilated. Household, as well as personal, cleanliness is always essential.

A wholesome diet, in which the fats, starches, and proteids are harmoniously combined, should be chosen.

Overwork, anxiety, worry, exhaustion, and intemperance should be avoided.

Those who are tuberculously susceptible should select an out-of-door occupation.

THE USE OF MEAT OR MILK FROM SUSPECTED SOURCES.

Tuberculosis is a disease prevalent among cattle, and eminent authorities believe that it can be communicated to man by the products mentioned. Meat from suspected sources should be thoroughly cooked if used at all, and milk, except it be from sources known to be clean and healthful, should be heated nearly to the boiling point, and maintained there for twenty or thirty minutes.

CONSUMPTION NOT HEREDITARY.

Until the discovery of the tubercle bacillus, it was believed by many that consumption was inherited. It is now known that such is not the fact. A family susceptibility, which may in some cases amount to a predisposition to the disease, may and sometimes does exist, but this is the only inheritance in

connection with consumption. A family tendency to contract the disease, is not, however, always an inherited one, but may be due to unsanitary environments, or to any other cause that impairs the vital resistance of the system to disease. But no matter how great may be the susceptibility, the disease will never be developed unless the system is invaded by the bacillus.

NOT AN INCURABLE DISEASE.

Consumption is by no means an incurable disease, although it is perhaps generally so considered by the public. It is a demonstrated fact, that there are very many recoveries, especially when treatment is commenced in the early stages of the disease,—in fact, it is stated by some authorities, that probably out of the total number of persons at some time or other infected with tuberculosis, the majority recover. Whether this statement can be substantiated or not, it is a demonstrated fact that there are a great number of recoveries. Therefore no patient in the early stages of the disease should regard his case as by any means hopeless. The advice of a reliable physician should be early sought and conscientiously followed.

ISOLATION.

It is wholly unnecessary to isolate or to place any social restrictions upon a consumptive patient who will faithfully carry out these reasonable measures to prevent the spread of the disease. Unlike some other diseases, the breath of the patient and the surface evaporations of the body do not carry the germs of the disease. Therefore, if the patient takes the precautions proven to be necessary, there is no occasion for his isolation.

On the other hand, in the case of insane tuberculous patients or persons who willfully violate the reasonable precautions prescribed, there might be a question as to whether isolation might not be justified.

DISINFECTION.

Disinfection should be practised in the case of rooms or apartments which have been occupied by consumptives, or

those in which such persons have died. There is a growing belief, supported by observation, that rooms which have been inhabited by consumptive families may become permanently infected, and ought not to be occupied until radical measures have been taken to cleanse and disinfect them. To secure such disinfection, remove the old paper and wash the walls, floors, and all woodwork with a corrosive sublimate solution. (See foot-note page 34.)

The bed and clothing of the last occupant should be disinfected by steam or by fumigation. Strong soapsuds is also an efficient disinfectant, and may be used for washing floors and woodwork. Walls, ceilings, etc., should be newly papered, whitewashed, or frescoed. The disinfection should be thoroughly performed, but especially so in cases where the habits of the consumptive in regard to the disposal of his sputum have been careless.

NOTE.—In the preparation of the foregoing circular, many American, as well as foreign, authorities have been consulted. Our acknowledgments are due the Medical Society of the State of Washington, and the State Boards of Health of Michigan and Massachusetts.

Copies of this ciruclar may be had gratuitously for distribution, by addressing the State Board of Health, Concord, N. H.

STATEMENTS AND OBSERVATIONS ON SOME OF THE MORE PROMINENT CAUSES OF DEATH IN NEW HAMPSHIRE.

CONSUMPTION.

A further consideration of consumption, from the standpoint of its mortality in New Hampshire, will not only reveal many interesting facts, but will also give additional weight to the importance of carefully studying this disease from every point of view.

The number of deaths annually occurring from consumption in this state is appalling in the light of modern sanitary and medical progress, which has revealed beyond controversy the exact cause of the disease and also shown it to be very largely preventable.

The registration of deaths has been for several years so complete that we are able to give very exact figures relative to the prevalence of this and other diseases for at least fourteen years—facts showing the number of deaths annually, the sex, ages by given periods, deaths by months, the period of life in which certain diseases are the most fatal, periods of comparative immunity, and other data essential to a complete understanding of the peculiar features of different diseases.

It may be remarked, incidentally, that the registration reports, containing little but figures, and to the average person almost, if not totally, uninteresting and useless, are, in sanitary work and in the interest of all public health measures, the most important publications we have—in fact they are the actual basis of all our knowledge regarding the prevalence of disease, its increase or diminution, the result of sanitary work, a guide for legislators and health officers, in fine, the basis of all accurate calculations in sanitation. It is through these reports that we are able to show whether or not work along certain lines accomplishes anything in the reduction of

the number of deaths from certain diseases. Take, for instance, consumption, which, by the reports referred to, we are able to demonstrate has been quite materially reduced during the past fourteen years.

PREVALENCE OF CONSUMPTION.

Consumption stands at the head of the list of fatal diseases during the past fourteen years, 1884-1897, inclusive. There are credited directly to this disease 10,466 deaths, chiefly pulmonary tuberculosis, or 747+ annually. These figures do not include deaths from "scrofula," "tabes mesenterica," "hydrocephalus," "tubercular meningitis," "tubercular disease of the joints," "lupus," or other conditions believed or known to be dependent upon the tubercle bacillus; therefore the total number of deaths caused by the germ of consumption is somewhat larger than the figures given in the accompanying tables.

Table No. 1 exhibits the number of deaths annually, the sex of the decedents, the total mortality for the state, and the percentage of deaths from consumption to the total mortality for the years 1884-1897, inclusive. This table is interesting in that it shows that the mortality from this disease is decreasing. Although in the earlier years represented in the table the returns of death were probably somewhat incomplete, it is reasonable to suppose that the relative proportion of deaths from consumption to the total mortality would be approximately correct. Were the fact not recognized that in the earlier years represented in the table the registration was not complete, the figures would indicate that the total mortality of the state has been increasing beyond what would legitimately follow from the increase in the population. This we are confident is not the case. Assuming that what we believe is true, then there should be in the column of totals, in Table No. 1, a larger number of deaths registered from consumption than appears. The figures would then show a considerable diminution in the mortality from this disease, since we know that the returns in recent years have been very nearly, if not quite, correct.

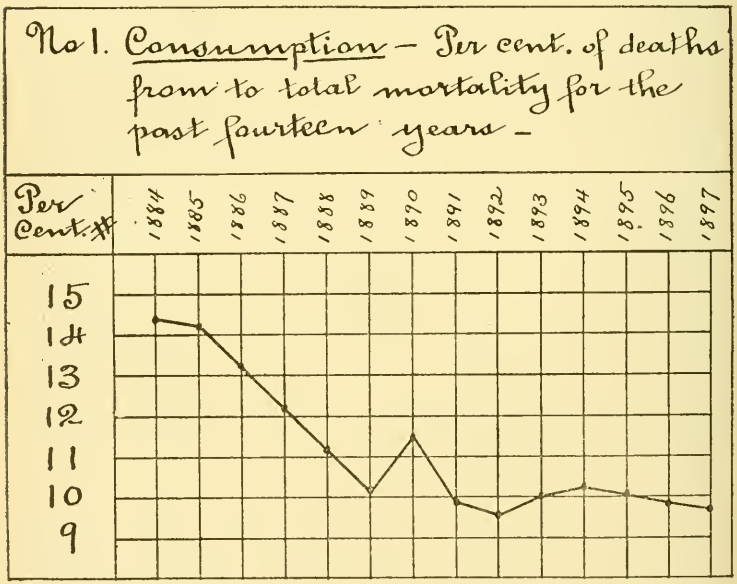
TABLE No. 1.

Showing the number of deaths annually, the total mortality for the state, and the percentage of deaths from consumption to the total mortality, for the years 1884–1897.

Years.	Totals.	Males.	Females.	Unknown.	Total mortality for state.†	Percentage to total mortality.
1884	868	354	513	1	6,003	14.46
1885	857	373	480	4	6,017	14.24
1886	809	367	442	....	6,168	13.11
1887	763	316	447	....	6,250	12.21
1888	742	314	427	1	6,596	11.25
1889	651	280	370	1	6,408	10.16
1890	825	382	443	....	7,106	11.61
1891	695	311	384	....	7,025	9.89
1892	736	318	418	....	7,699	9.56
1893	737	349	387	1	7,358	10.01
1894	714	307	407	....	6,898	10.35
1895	693	319	374	....	6,929	10.00
1896	679	289	390	....	6,791	9.99
1897	697	292	405	....	7,027	9.92
Total	10,466	4,751	5,887	*8	.....	.....

* Classed with males. † Not including premature and still births.

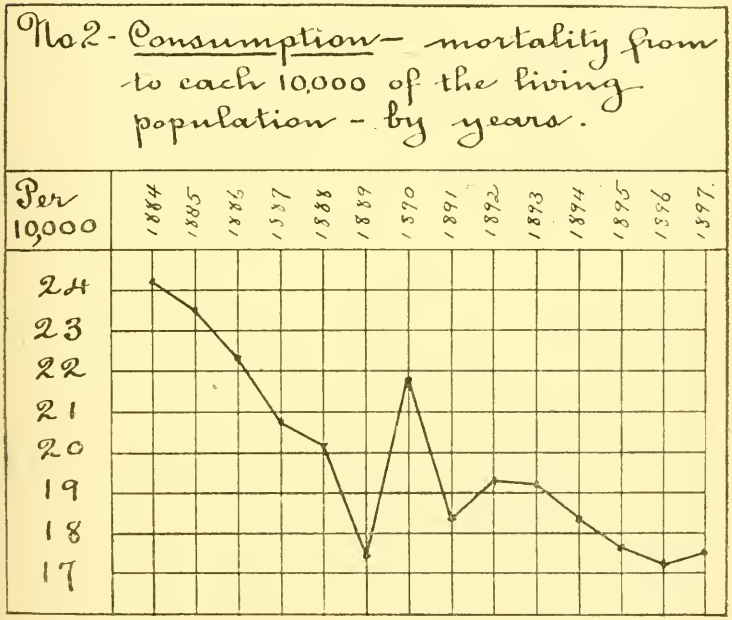
A gratifying view of the decrease in consumption in the past fourteen years is shown in Diagram No. 1. It will be seen that the general tendency of the mortality line is downward, the most noticeable exception being in the year 1890, which upward rise shows the effect of the epidemic of influenza which appeared in that year, and largely increased the number of deaths from consumption. This diagram is based upon the percentage of deaths from consumption to the total mortality in each year represented.



* To total mortality.

As a further corroboration of the assertion that the mortality from consumption in New Hampshire is being reduced, we present Diagram No. 2, which gives the mortality from consumption to each 10,000 of the living population for each year represented. Calculated upon this basis the mortality line is strikingly like that in Diagram No. 1, the sharp rise in 1890, on account of influenza, being well marked.

We have, therefore, figures and calculations from three sources showing a reduction in the number of deaths from consumption: 1st, in the actual number of deaths reported annually; 2nd, in the proportion of deaths to the total mortality, and, 3rd, in the proportion of deaths returned to each 10,000 of the living—all of which prove a very marked and gratifying diminution in the fatality of this disease in this state. There were returned in 1896, six hundred and seventy-nine deaths from consumption, and in 1897, six hundred and ninety-seven deaths, nearly two hundred less than were reported in 1884.



SEX.

Of the 10,466 deaths from this disease returned for the fourteen years given, 4,751 were males, 5,887 females, and 8 with sex not stated. In other words, 43.75 per cent of the decedents were males and 56.25 per cent females. The excess of female over male decedents was 1,136.

This field is an interesting one for those who desire to study or search out the effect of social and individual environment upon the ravages of this disease.

Statistics covering a longer period than are available in our own state, show some interesting facts relative to the mortality from consumption, by sex. In England, for instance, the mortality was greater among females than among males until the year 1866, in which year and from which time the mortality has been less among females than among males, with a ratio constantly widening.

Statistics in Massachusetts from about 1851 to 1862 show a very much greater mortality among females than among males, and from the latter year to 1895 the mortality among females was still in excess of the male decedents, although not so marked as in the former period. In 1895 the female decedents fell below the male mortality for the first time recorded.

In New Hampshire the female mortality has been in excess of the male in each of the fourteen years under consideration.

SEASONS.

Table No. 2 exhibits the number of decedents from consumption, for the years represented, by months. It will be seen by the totals that nothing can be deduced to show that the mortality from this disease is particularly influenced by seasons. The malady is so varied in its duration, from a few weeks to several years, that we cannot see how any definite information can be obtained to show the influence of seasons as a factor in the mortality from consumption, although some observers assert to the contrary and claim to be able to show that both temperature and humidity are marked factors which can be recognized in the causation of pulmonary consumption.

AGES.

Table No. 3 represents the deaths from consumption from 1884-1897, inclusive, by age periods, with totals. Studying the number of deaths given for each age period, it will be seen that by far the greater number of deaths occurred in per-

TABLE No. 2.

Showing the number of deaths from consumption, 1884–1897, by months, with percentages.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Unknown.
1884	79	61	68	74	101	77	72	51	65	79	68	70	3
1885	71	82	87	79	83	96	64	54	54	65	65	55	2
1886	78	82	77	81	68	58	62	72	54	64	55	57	1
1887	72	63	63	67	82	61	58	60	54	73	52	58	.....
1888	66	52	64	55	72	82	61	58	55	52	53	70	2
1889	54	63	69	54	45	48	63	56	47	52	48	51	1
1890	90	62	81	74	74	72	67	58	56	52	63	75	1
1891	69	54	52	66	67	61	60	48	62	52	48	54	2
1892	67	69	70	58	64	50	76	57	53	60	66	43	3
1893	59	41	62	79	56	54	68	54	67	59	59	79	.....
1894	61	48	64	53	64	73	61	73	53	58	59	46	1
1895	60	58	70	68	65	49	53	61	50	61	55	43	.....
1896	58	68	79	63	60	41	54	53	51	65	40	47	.....
1897	53	57	70	64	65	70	62	54	49	62	49	41	1
Total	937	860	976	935	966	892	881	809	770	854	780	789	17
Percentage	8.95	8.21	9.32	8.93	9.23	8.52	8.41	7.73	7.35	8.16	7.45	7.45	

TABLE No. 3.

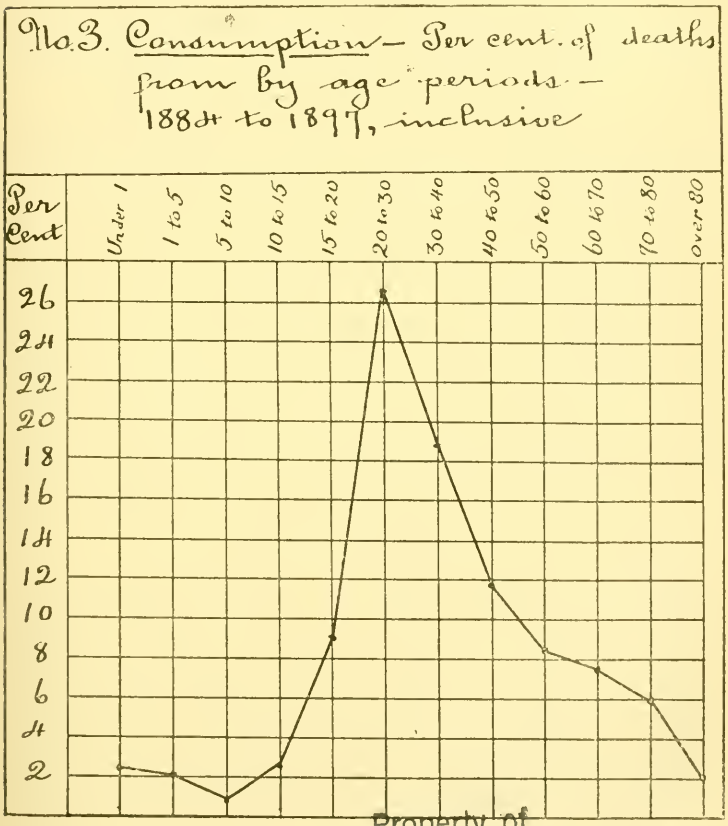
Showing the number of deaths from consumption, 1884–1897, by age-periods, with totals and percentages.

Years.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884.....	16	12	10	21	94	232	148	96	71	61	64	22	21
1885.....	31	14	4	12	91	218	159	107	76	75	42	19	9
1886.....	13	24	7	11	76	233	152	91	67	74	37	18	6
1887.....	15	12	7	15	73	191	145	101	78	54	46	21	5
1888.....	24	20	4	19	69	219	137	71	62	55	42	15	5
1889.....	14	15	7	22	59	147	120	77	56	65	53	10	6
1890.....	25	17	7	16	61	200	156	113	65	72	63	23	7
1891.....	19	19	9	17	70	174	131	89	67	37	43	10	10
1892	14	12	2	22	66	178	150	84	67	71	41	20	9
1893.....	32	11	3	17	54	204	140	91	65	64	35	12	9
1894.....	23	17	11	9	61	200	150	82	59	45	45	8	4
1895.....	14	9	8	15	51	210	129	85	60	49	51	10	2
1896.....	15	17	9	12	69	180	130	85	59	49	37	9	8
1897.....	17	13	6	14	65	225	143	70	46	49	32	12	5
Total.....	272	212	94	222	959	2,811	1,990	1,242	898	820	631	209	106
Percentage....	2.59	2.02	.89	2.12	9.16	26.86	19.01	11.87	8.58	7.83	6.03	1.99	

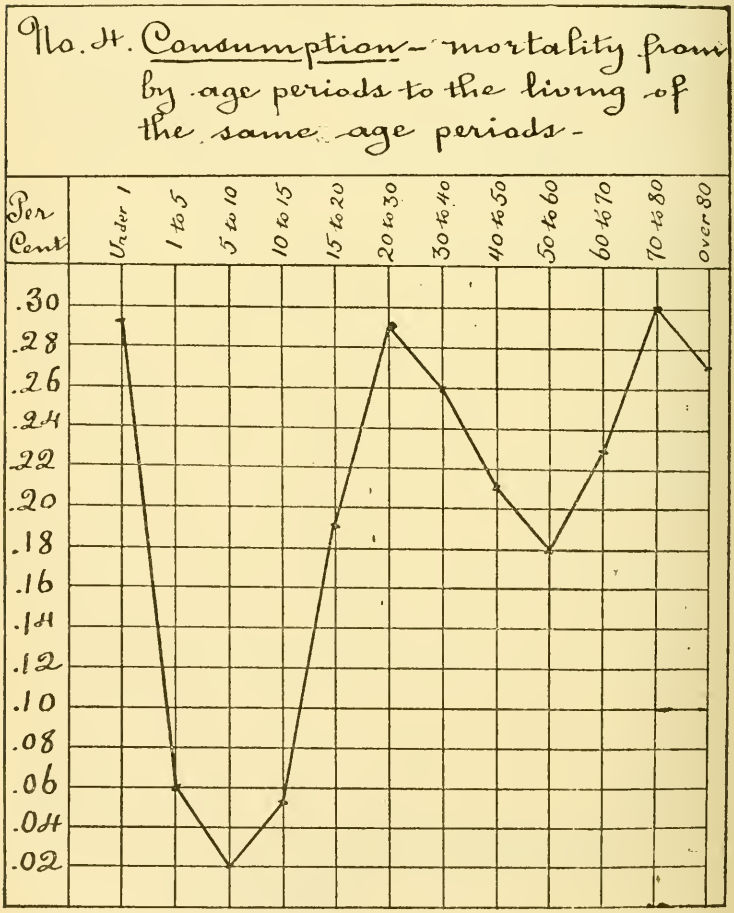
sons between the ages of 20 and 30, the next highest number being among persons between 30 and 40 years of age, while above and below these age periods the mortality figures diminish quite progressively each way, with the exception that in the age period, 5-10, fewer deaths are recorded than in any other period.

The mortality line by age periods is graphically shown in Diagram No. 3, in which is also given the percentage of deaths from consumption for the fourteen years.

Without a further study of this subject the diagram just referred to would be very misleading, in giving the idea



that from 30 to 40 was relatively much the most dangerous period of life with respect to this disease, and that the earlier years, as well as the later, in life were comparatively free from liability to it. Such is not the fact, because one should take into consideration the number of persons living at each age period in order to know the relative liability to the disease at certain periods of life. This is presented in Diagram No. 4, which shows the total mortality rate from 1884-1897, inclusive, by age periods, to the living population of the same



period, as returned by the census of 1890. We assume that the census of that year fairly represents the average by age periods for the fourteen years considered, inasmuch as the population of New Hampshire is comparatively non-fluctuating, and is changed only by a slow and steady growth, as was shown in the decade from 1880-1890.

Reckoned on this basis it will be seen that actually the greatest percentage of decedents to those living of the same age occurs in children under one year of age, after which age there is a great drop in the percentage, so that the period of life least liable to contract the disease is that included between the ages of one year to fifteen. From 15 to 30 there is a rapid rise, so that between the ages of 20 and 30 the highest point—that is, the greatest liability to the disease in middle life, is reached. From 30 to 60 there is a decrease in the relative danger, while from 60 to 80 there is a marked increase, so that after the first year of life is passed, the greatest liability to death from the disease in a whole lifetime is between the ages of 60 and 80.

These figures are based upon the actual mortality records of over 10,000 deaths occurring in New Hampshire during the past fourteen years, and if the assumption regarding the census is correct, then the diagram represents, absolutely and accurately, the percentages given.

For the mortality from consumption, by towns, cities, and counties, and for general statistical study of the disease, reference should be made to the Registration reports.

TYPHOID FEVER.

During the past fourteen years there have been registered in this state 1,920 deaths from typhoid fever, 1,024 of the decedents being males, and 896 females.

For the two years covered by this report the deaths from typhoid fever were as follows: In 1896, 139 deaths, 84 males, and 55 females; in 1897, 92 deaths, 47 males, and 45 females. In the latter year the number of deaths registered from this disease was less than for any previous year.

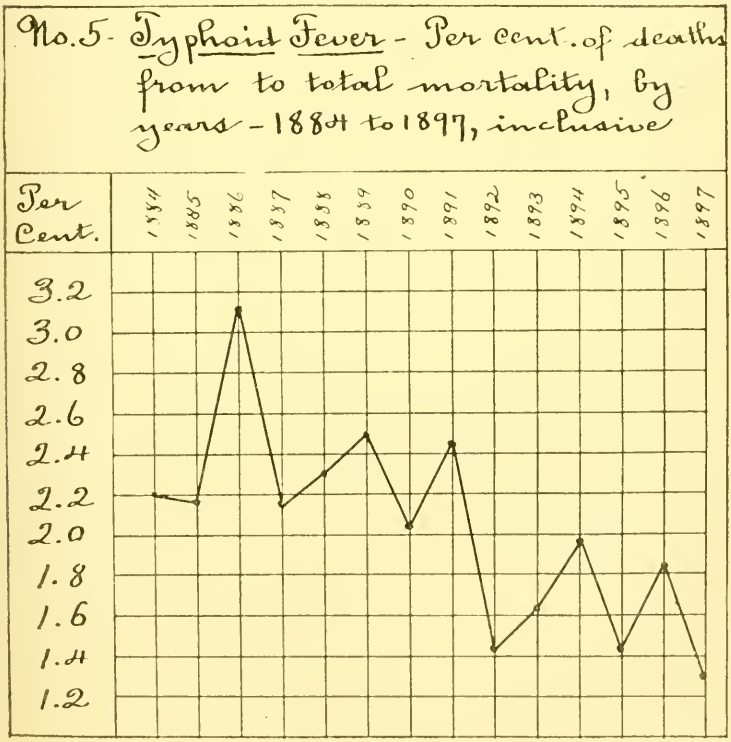
TABLE No. 4.

Showing the number of deaths annually, the total mortality for the state, and the percentage of deaths from typhoid fever to the total mortality for the years 1884–1897.

Years.	Total.	Males.	Females.	Total mortality.	Percentage.
1884	137	63	74	6,003	2.28
1885	136	65	71	6,017	2.26
1886	194	105	89	6,168	3.14
1887	134	68	66	6,250	2.14
1888	150	87	63	6,596	2.27
1889	161	85	76	6,408	2.51
1890	143	76	67	7,106	2.01
1891	170	103	67	7,025	2.42
1892	109	52	57	7,699	1.42
1893	121	60	61	7,358	1.64
1894	135	72	63	6,898	1.96
1895	99	57	42	6,929	1.43
1896	139	84	55	6,791	2.05
1897	92	47	45	7,027	1.31
Total	1,920	1,024	896	94,275	

Table No. 4 represents the number of deaths in this state, from typhoid fever, from 1884-1897, inclusive, with sex of decedents, the total mortality by years, and the percentage of deaths from typhoid to the total mortality.

It will be seen by a glance at the totals by years, that the variation in the number of deaths from year to year is quite marked in some instances, as, for example, in 1886 there were more than twice as many deaths from typhoid as in 1896. There are various reasons for the fluctuation in the prevalence and mortality of this disease, among which it is believed that climatic conditions form no small factor. It has been quite conclusively demonstrated that typhoid fever prevails more extensively in seasons of the least amount of rainfall, or, in other words, when the distance between the surface of the ground and the level of the soil-water is greatest. In such a season there is a marked increase in the number of cases, although this does not give rise to epidemics, the latter being dependent almost wholly upon the general infection of a



water supply, or, rarely, the milk supply. But these questions are more properly discussed elsewhere.

A glance at Diagram No. 5 graphically illustrates the variation in the mortality from this disease from year to year, and what is of more importance, shows the downward tendency of the disease. This is doubtless due to a better understanding of the nature of the disease and the measures necessary to prevent infection, and especially how to restrict its spread among other members of a family in which a case appears.

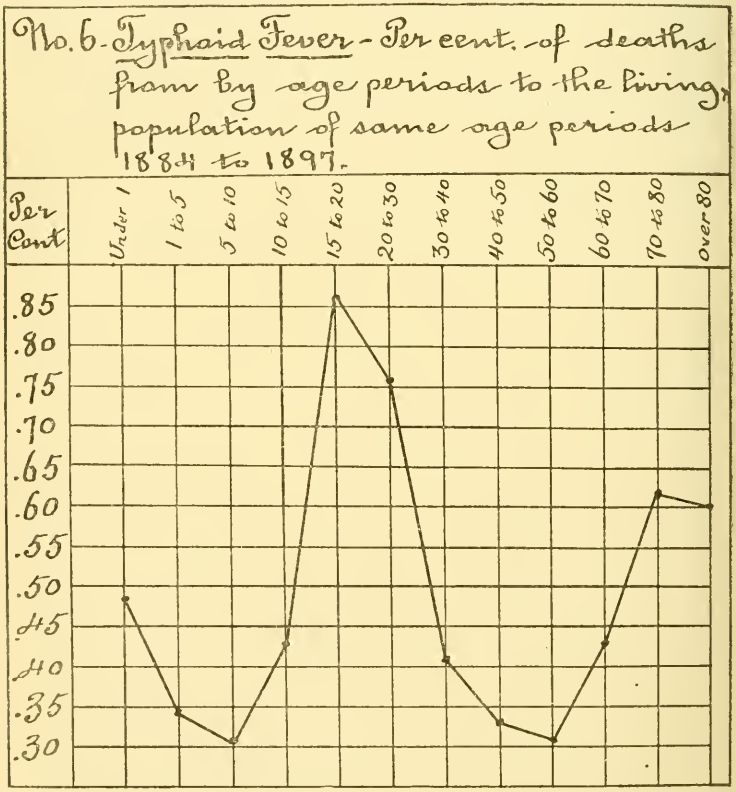


TABLE No. 5.

Showing the number of deaths from typhoid fever, 1884–1897, by age periods, with percentages.

Years.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884	5	10	7	11	21	34	12	8	7	8	8	3	3
1885	2	7	7	11	20	34	14	8	7	10	11	3	2
1886	2	6	15	12	33	51	16	12	15	14	16	2	....
1887	2	6	1	16	22	41	17	8	7	6	5	2	1
1888	3	13	4	11	26	39	12	8	8	9	8	3	6
1889	4	5	9	14	26	50	13	14	10	5	6	4	1
1890	1	3	10	11	24	33	18	14	10	7	7	3	2
1891	1	3	14	12	27	52	17	15	8	9	8	3	1
1892	1	6	4	10	17	24	18	8	5	6	3	4	3
1893	1	8	3	9	23	29	22	10	5	5	3	1	2
1894	.....	8	5	6	18	39	19	11	9	10	8	2	....
1895	1	2	2	7	19	28	10	12	4	7	3	1	3
1896	7	4	7	6	18	47	21	6	6	10	5	1	1
1897	1	2	9	4	18	22	12	8	10	4	1	1	....
Total	31	83	97	140	312	523	221	142	111	110	92	33	25
Percentage	1.61	4.32	5.05	7.29	16.25	27.24	11.51	7.39	5.78	5.73	4.79	1.72	....

TYPHOID FEVER BY AGES.

In Table No. 5 will be seen the registration of deaths from typhoid fever by age periods from 1884-1897, inclusive, together with the percentage of deaths, by age-periods, to the total mortality from this disease for the period given. It will be seen that more than one quarter of the actual number of deaths that occurred were of persons between the ages of 20 and 30 years, while the next greatest number were between the ages of 15 and 20. In these two periods

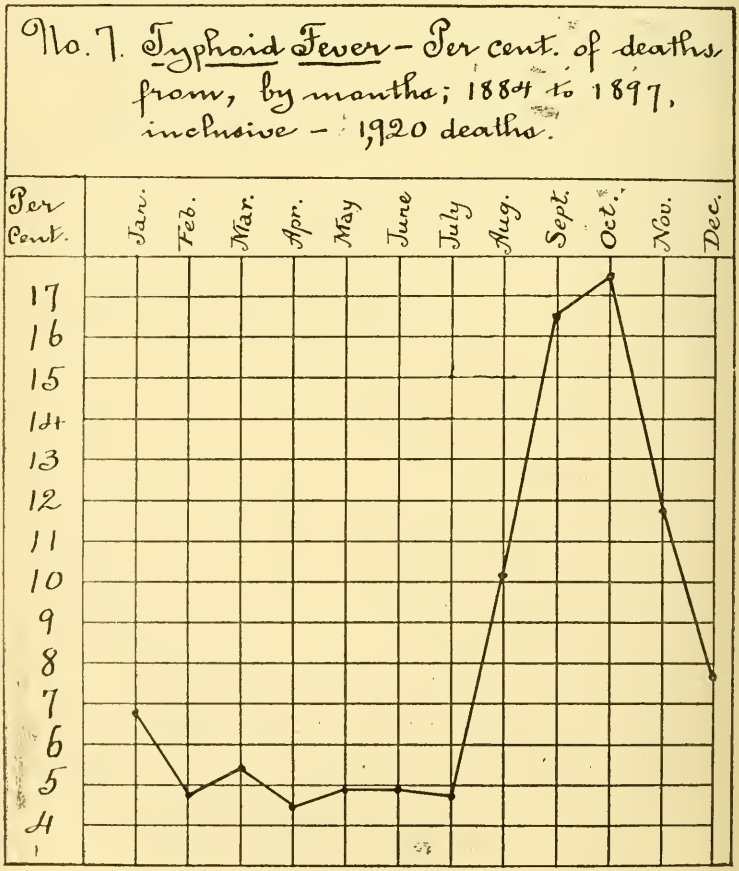


TABLE No. 6.

Showing the number of deaths from typhoid fever, 1884–1897, by months, with totals and percentages.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Unknown.
1884	8	6	6	6	4	2	5	18	22	31	17	10	2
1885	8	8	12	7	11	12	2	9	28	16	12	11	....
1886	8	11	9	9	5	12	10	26	26	44	22	12	....
1887	5	5	7	8	7	2	4	19	32	22	14	9	....
1888	9	7	6	7	6	11	6	18	22	21	18	18	1
1889	10	6	8	7	6	7	12	15	20	35	22	13	....
1890	20	12	10	6	8	3	9	9	27	19	12	8	....
1891	12	7	7	4	8	4	4	19	22	31	35	17	....
1892	8	4	5	2	9	4	7	7	16	19	16	12	....
1893	6	4	11	4	9	6	10	14	17	21	13	6	....
1894	12	4	6	5	10	6	7	12	23	30	14	6	....
1895	6	2	3	4	4	7	.....	11	25	18	11	8	....
1896	12	14	8	9	6	12	9	9	20	17	10	12	1
1897	7	3	6	8	2	7	8	7	16	12	8	8	....
Total	131	93	104	86	95	95	93	193	316	336	224	150	4
Percentage	6.82	4.84	5.42	4.48	4.94	4.94	4.84	10.05	16.46	17.50	11.66	7.81	....

more deaths occurred from typhoid than in any other of the age periods given. It is also true that the percentage of deaths from typhoid to the living population of those periods was greatest in these two periods, but they are reversed.

A glance at Diagram No. 6 shows the percentage of deaths from typhoid fever, by age periods, to the living population of the same period. This diagram accurately illustrates the liability line of the disease. The period of life most susceptible to this disease is included in the age period, 15-20, and the next most susceptible period is 20-30. After thirty the drop in the line of mortality is very marked, and from forty to sixty still diminishes, after which period of life it ascends to quite a marked degree, as will be seen by studying the diagram.

SEASONS.

Table No. 6 shows the deaths from typhoid fever, by months, for the fourteen years given. A study of these figures, especially in connection with Diagram No. 7, shows very emphatically the great increase in this disease during the autumnal months of the year. It was formerly believed, even by experienced physicians, that typhoid fever never prevailed in the winter months, a theory which, since the registration of vital statistics has been required, has been disproved.

The following, relating to the restriction and prevention of typhoid fever, was issued as a circular during the year, and has been quite extensively distributed among local boards of health:

THE PREVENTION OF TYPHOID FEVER,

SOMETIMES CALLED "ENTERIC FEVER," "GASTRIC FEVER," "PYTHOGENIC FEVER," "CESSPOOL FEVER," ETC.

Typhoid fever is one of the preventable diseases, and sanitarians and physicians very generally agree that there is no excuse for its existence in any community. This opinion is based upon the fact that intelligent and well-directed efforts to restrict the disease are attended with most successful results, thereby proving that the laws through which it operates are well understood by those who have studied the subject and that the disease is capable of being controlled by proper measures.

On an average, about 150 deaths are annually reported in this state as having occurred from typhoid fever. This mortality represents from 1,200 to 1,500 cases of the disease annually. A large proportion of this mortality can and ought to be prevented.

The greatest number of deaths from this disease is of persons in the prime of life, and this should prompt to greater efforts for the prevention of the disease. Persons of all ages are liable to it, and although they may have it in a mild form in many instances, yet they may be the medium of communicating the disease in a fatal form to others. Although it is not one of the most contagious diseases, *it is communicable to others.*

It is not considered directly transmittible from the sick to the well, but the patient eliminates from his person, chiefly through the excreta, the germ which produces the disease. The germ will soon perish if not placed under conditions favorable to its development; but any mass of decomposing organic matter, such as cesspools, filthy drains, damp and unclean cellars or rooms, etc., and filth in any form, affords a fertile soil for the reproduction of the typhoid fever germ. Hence it follows that privy-vaults, cesspools, filthy drains, etc,

become centers of contagion, and dangerous localities when typhoid fever is prevalent. The danger from them is vastly increased, because the fluid portion of their contents, charged with the germs of disease, permeates the soil and is often carried by underground water currents to neighboring wells, which in this way become poisoned. If there is any weight in the testimony of close observers and careful investigators, then the evidence is overwhelming that typhoid fever is a filth disease. So general is the belief that filth in some form is necessary to support this disease, that its very name suggests uncleanliness, defective sewerage, bad drainage, foul vaults and cellars, filthy sink-drains, contaminated drinking water, etc., etc.

The poison of typhoid fever may possibly sometimes be inhaled into the system, but in the great majority of cases the disease germ undoubtedly finds its way into the intestinal canal by means of the food and drink. Reflection will show, and experience teaches, that there are many ways in which our food and drink may become contaminated with the germs. Some of the most frequent ways are these : The discharges are thrown into the privy or upon the ground, whence they soak, sometimes long distances, through the soil into the family well. The soiled clothes of the patient are washed, and the water carried by a loose and leaky drain which runs too near the well. Some kinds of food and drink are very absorptive of disease germs, and being kept too near the patient, become contaminated. Cases are known where milkmen, with fever at their own homes, have caused serious outbreaks of the disease among their customers, by keeping the milk, before it was distributed, too near the sick, by diluting it with contaminated water, or even rinsing the cans with such water.

Prevention.

1. Keep your premises at all times in a good sanitary condition. Filth is the *nidus* in which the cause, or germ, of the disease may be developed. Of all forms of filth none

others are so dangerous to our homes as the "hole-in-the ground" privy, and the sink-drain. The former should never be tolerated, nor the latter, either, in its usual forms.

Filth, in its sanitary signification, includes not only the grosser forms, but also the less tangible and more *respectable* kinds which are often ignored. The impalpable but not inodorous air of unventilated bedrooms is disgusting and dangerous; the sewer-air which leaks from faulty water-closets or defective drainpipes in the homes of the wealthy consigns many to the tomb; the emanations from rotting chips or sawdust, the exhalations from decaying vegetables in the cellar—all these may dangerously pollute the air, and should be avoided.

2. All discharges from the fever patient should be received in a vessel containing a pint or more of Solution No. 1 (see page 61), and kept covered by the disinfectant three or four hours, and then buried in the earth where they cannot by any possibility find their way into wells, springs, or brooks. *They should never be allowed to mingle with any kind of filth, in a privy or elsewhere.*

The clothing, both of bed and patient, should be disinfected by dropping it into a tub containing several gallons of Solution No. 2 (see page 61), and should be kept therein until it can be boiled. After death or recovery disinfect the room by sulphur fumigation (see page 62), followed with washing the floors and other woodwork with Solution No. 1, or No. 2.

3. As far as concerns the personal hygiene of nurses and attendants, it may be said that, if the foregoing preventive measures are carefully carried out, there is hardly a possibility of their taking the disease; in fact, under such conditions, cases in which the attendants have taken the disease from the patient are almost if not quite unknown. Typhoid fever goes through families because all have been exposed to the disease-producing cause; or the first cases contaminate the water supply, or "seed down" the privy vault and the house surroundings with the disease germs.

Nurses and others in the family should eat nothing in the room where the patient is, nor anything which has been there.

The food for the attendants and family should be prepared and kept as far from the sick as possible. Thorough boiling will kill all disease germs; so, while the fever is in the house, it is safer to boil all water and milk just before it is used.

Bodies of those dead from typhoid fever should be wrapped in a cloth wet with either Solution No. 1 or Solution No. 2, and at once buried.

The room in which there has been a case of typhoid fever, whether fatal or not, should, with all its contents, be thoroughly disinfected by exposure for twenty-four hours to strong fumes of burning sulphur immediately after it has ceased to be occupied by the patient, and then it should for several hours, if possible for days, be exposed to currents of fresh air.

Upon the discovery of a case of typhoid fever by the attending physician, he should immediately notify the local board of health and should co-operate with the board to restrict the disease. Upon receiving such notice the local board of health should :

1. Give public notice of infected places, so that no person may unguardedly drink water or take food from a source likely to be contaminated, or unduly expose themselves to the disease.

2. Investigate the probable source and mode of origin of the disease. If probably from a contaminated well or general water supply, see that measures are taken by stopping its use, by boiling it, or otherwise, to prevent further cases being caused in the same manner. If connected with the sewer, see that the plumbing is in good order and all fixtures properly trapped.

3. Order and enforce the disinfection of all discharges from the bowels of patients sick with typhoid fever. It is safest that the discharges of all persons who have diarrhea shall be disinfected.*

4. Disinfect the contents of the privy on the premises, or any other that has been used by the patient.†

* For this purpose use disinfectant No. 1 freely.

To keep a privy vault disinfected during the progress of an epidemic, sprinkle chloride of lime freely over the surface of its contents daily, or use a quart of Solution No. 1 daily.

5. Order and secure the disinfection of all articles of clothing or bedding that have been soiled by discharges from the patient.

6. Secure the co-operation of the people in the prevention of this disease, by teaching them its modes of spreading, the best methods for its prevention, and the greater importance of efforts for its prevention in times of drought and low water in wells.*

7. See that the premises are properly disinfected after the death or recovery of the patient.

Disinfectants.

solution no. 1.†

Chloride of lime (bleaching powder) . . one pound.
Water . . . . . four gallons.
Mix.

All clothing or bedding soiled by the patient's discharges must be removed *at once, and placed in boiling water, to be boiled for half an hour;* or they may be immersed in the following solution, allowing them to remain for two hours, when they may be wrung out and sent to the laundry, to be thoroughly boiled :

solution no. 2.

Sulphate of zinc . . . . . one pound.
Common salt . . . . . one half pound.
Water . . . . . four gallons.
Mix.

Nurses and attendants should observe perfect cleanliness, and their hands should be frequently bathed in Solution No. 2.

* Wells are more dangerous at times of low water, because the area of drainage to the well is greatest when the water is the lowest.

† For a free and general use in privy-vaults, sewers, sink-drains, refuse heaps, stables, and wherever else the odor of the disinfectant is not objectionable, this is one of the cheapest and most effective disinfectants and germicides available for general use.

Chloride of lime ought to be obtained anywhere for ten cents a pound; in some places it ean be obtained for five cents a pound.

This is one of the best disinfectants known.

FUMIGATION WITH SULPHUR

Has ever been regarded as a reliable method of disinfecting a house, and should be resorted to after a case of smallpox, diphtheria, scarlet fever, or typhoid fever, and in such other cases as the attending physician may think best. To do this, the house must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with solutions, should be opened and exposed during fumigation, as follows: Close the room as tightly as possible, place the sulphur in iron pans supported by bricks placed in wash-tubs containing a little water, set it on fire by hot coals, or with the aid of a spoonful of alcohol, and allow the room to remain closed for twenty-four hours. For a room about ten feet square, at least three pounds of sulphur should be used; for larger rooms, proportionally larger quantities. Heavy woolen clothing, silks, furs, stuffed bed covers, beds and other woolen articles, which cannot be treated with disinfectants, should be hung in the room during fumigation, their surfaces thoroughly exposed, and their pockets turned inside out. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, and their contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but they should afterward be removed to the open air and thoroughly beaten.

Remarks.

Disinfection, following every infectious or contagious disease, should be carried out under the supervision of the local board of health, or by some competent person authorized by the board. Much of the so-called disinfection practiced by many families is wholly inefficient and useless. The odor of burning coffee, tar, sulphur, or any other substance in the sick room, or other part of the house or premises, in the presence of the patient, or other persons, operates only as a deodorizer, and

does not destroy the germs of the disease. This is an important fact that every family should understand.

NOTE.—This document is published by the State Board of Health for gratuitous distribution throughout the state. A copy may be obtained by applying to the board, Concord, N. H.

Local boards of health and physicians are requested to obtain and distribute copies of this circular in localities where the disease makes its appearance. Copies will be furnished for this purpose upon application.

In order that this document may do the greatest possible good, it is hoped that each one who receives it will not only make such use of it as will tend to disseminate most widely the suggestions and statements of fact contained therein, but will also act for the restriction and prevention of this disease in accordance wih its suggestions, and by other effective methods and measures.

DIPHTHERIA AND CROUP.

Although it has been demonstrated that diphtheria and croup are one and the same diesase, the distinction is still maintained in the mortality returns, hence they are tabulated separately in the same table for the purpose of showing under what terms this cause of death is returned, and also because it has been the custom to make the distinction herewith given. It is known, however, that membranous croup is laryngeal diphtheria, and there is no occasion, from a sanitary standpoint, to make two classifications for the same disease.

Diphtheria is a communicable disease, against the infection of which every possible precaution should be taken, especially among children. For the year 1897, 143 deaths were reported in this state from diphtheria and croup, 82 from the former, and 61 from the latter disease; in other words, there were 143 deaths from diphtheria in New Hampshire during the year mentioned. The average number of deaths from this disease for the past fourteen years was 181 annually, the total number of deaths from the disease for the period named being 2,540. The smallest number of deaths returned in any year of the period given was in 1893, when there were reported 99 deaths.

A glance at the table will show that the mortality from diphtheria for the past five years has been considerable less than for the preceding five years. We believe that the mortality should be reduced below the smallest figures given, and

TABLE No. 7.

Mortality from Diphtheria and Croup from 1884 to 1897, inclusive.

Years.	Deaths.			Percentages of deaths to deaths from all causes.			Death rates per 10,000 living.		
	Croup.	Diphtheria.	Total.	Croup.	Diphtheria.	Total.	Croup.	Diphtheria.	Total.
1884.....	49	110	159	.79	1.77	2.56	1.36	3.06	4.42
1885.....	74	78	152	1.19	1.25	2.44	2.04	2.15	4.19
1886.....	64	156	220	.99	2.41	3.40	1.75	4.27	6.02
1887.....	84	177	261	1.29	2.73	4.02	2.28	4.81	7.09
1888.....	94	103	197	1.37	1.50	2.87	2.53	2.77	5.30
1889.....	88	210	298	1.31	3.13	4.44	2.35	5.61	7.96
1890.....	64	164	228	.86	2.21	3.08	1.69	4.32	6.02
1891.....	56	160	216	.79	2.20	2.10	1.48	4.22	5.69
1892.....	45	134	179	.56	1.69	2.25	1.18	3.50	4.68
1893.....	36	63	99	.47	.82	1.29	.93	1.63	2.57
1894.....	44	73	117	.64	1.05	1.69	1.13	1.88	3.01
1895.....	49	78	127	.71	1.12	1.83	1.25	1.99	3.25
1896.....	59	85	144	.87	1.25	2.12	1.49	2.16	3.65
1897.....	61	82	143	.87	1.17	2.04	1.53	2.06	3.59
Total..	867	1,673	2,540	.....	.....	.....	.....	.....	.....
Average	62	119	181	.91	1.73	2.54	1.63	3.17	4.80

that this might be accomplished through a careful diagnosis, based upon bacterial examination, in each case, a strict isolation of those infected, and prompt treatment with antitoxin.

Table No. 7 gives the number of deaths from diphtheria and croup, percentage of deaths to deaths from all causes, and the death rate per 10,000 of the living population for the fourteen years, 1884-1897, inclusive.

DIPHTHERIA BY AGES.

Diphtheria is essentially a disease of childhood and early life, although no age is exempt from it.

Table No. 8 gives the deaths from diphtheria by age periods, for the past fourteen years. It will be seen that over 45 per cent of the deaths occurred in children between the ages of 1 and 5 years; that over 26 per cent were in the age period, 5-10; that over 10 per cent were in children under one year of age; that over 8 per cent occurred in children between the ags of 10 to 15; and that after the latter age the number of deaths, by age periods, rapidly diminishes to a very small percentage.

These facts are graphically represented in Diagram No. 8, the very marked and conspicuous lesson of which is, that diphtheria is a disease chiefly of childhood. The diagram suggests another point, the most important of all, which is that if children can be carried by this disease, or, in other words, protected from it, the danger of contracting it in after life, or, at least, of its terminating fatally, is exceedingly small. To this argument the objection cannot be made that is inconsiderately and erroneously maintained by some in connection with scarlet fever and measles, to wit, that the reason why a greater mortality from these diseases does not occur in later life, is because so many persons have them in childhood, and are thereby protected. This specious argument does not hold in any of these diseases, and must be totally untrue in diphtheria, inasmuch as the individual is not protected from subsequent attacks by reason of having had the disease.

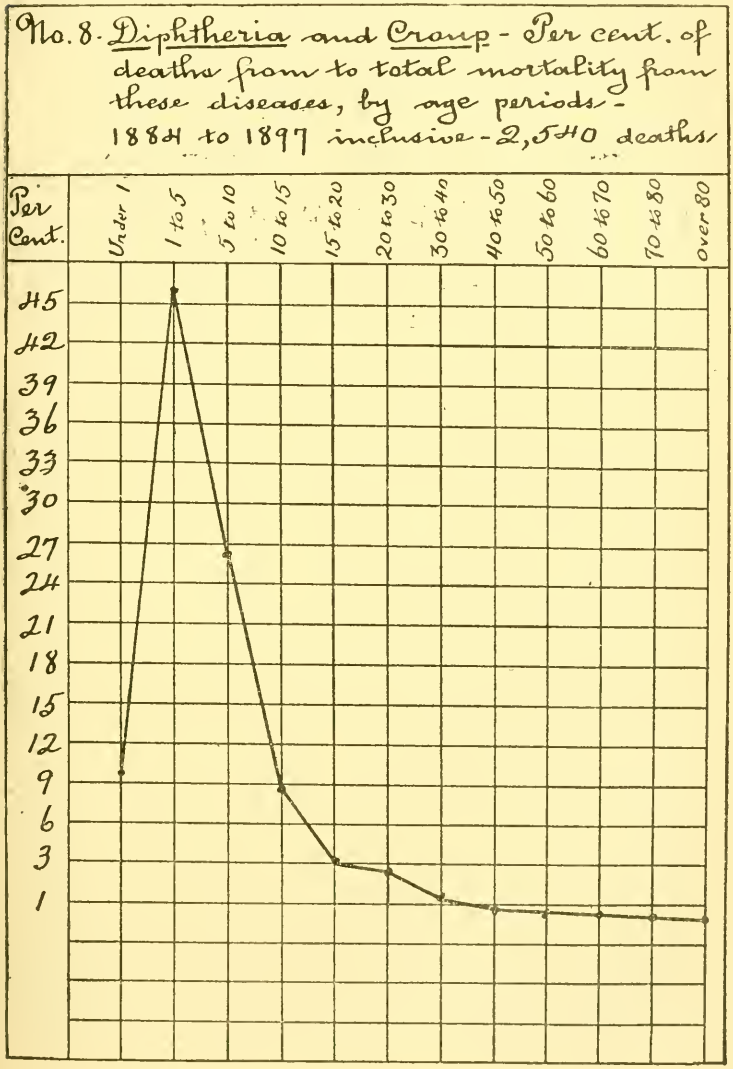
TABLE No. 8.

Diphtheria and croup, deaths from, by age periods, from 1884–1897, inclusive.

Years.	Whole number.				Ages.											
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884.....	159	72	87	..	16	74	40	17	4	2	.....	1	3	....	....	1	1
1885.....	152	79	72	1	30	73	31	5	3	5	2	1	2	....	....	.....	....
1886.....	220	106	114	..	22	93	68	23	7	3	1	1	2	....	....	.....	....
1887.....	261	127	133	1	33	122	58	22	6	9	4	2	1	1	2	.....	1
1888.....	197	96	101	..	22	110	45	7	4	2	2	1	2	1	1	.....	....
1889.....	298	139	157	2	18	151	79	20	13	10	3	3	....	....	....	.....	1
1890.....	228	109	117	2	22	105	51	27	10	3	4	3	....	....	....	1	2
1891.....	216	122	93	1	11	37	84	50	17	7	2	4	....	....	1	.....	3
1892.....	179	99	80	..	15	85	43	15	6	6	2	2	....	2	....	.....	3
1893.....	99	44	55	..	14	39	29	11	1	3	1	1	....	....	....	.....	....
1894.....	117	58	59	..	20	57	28	6	.....	2	2	1	....	....	....	1	....
1895.....	127	62	65	..	10	65	33	6	3	4	1	1	1	....	1	.....	2
1896.....	144	52	92	..	17	73	35	10	2	4	2	....	1	....	....	.....	....
1897.....	143	75	68	..	11	77	42	6	1	2	2	1	....	1	....	.....	....
Total....	2,540	1,240	1,293	*7	261	1,161	666	225	77	62	28	22	12	5	5	3	13
Per cent.	.....	49.09	50.91	..	10.27	45.71	26.22	8.86	3.03	2.44	1.10	.86	.47	.19	.19	.11	....

*Classed with males.

In connection with the subject of deaths among children from the infectious and contagious diseases, a glance at the diagram just mentioned, No. 8, in connection with similar diagrams on scarlet fever and measles will be exceedingly interesting.



Seasons.

The mortality from diphtheria is greatest during the colder months of the year, the highest mortality for the fourteen years mentioned being in October, 12.32 per cent; in November, 11.61 per cent; December, 11.34 per cent; January, 10.19 per cent; February, 8.78 per cent; March, 8.11 per cent; September, 7.52 per cent; May, 6.65 per cent, June, 6.26 per cent; April, 6.14 per cent; July, 5.63 per cent, and August, 4.88 per cent.

Sex.

Sex does not appear to be a factor in this disease, judging from the statistics presented. Of the 2,540 deaths, from 1884 to 1897, 1,240 of the decedents were males, and 1,293 females, while in seven cases the sex was not given. It will, therefore, be seen that the mortality was very nearly equal between the sexes.

SCARLET FEVER.

The total number of deaths from scarlet fever for the year 1897 was 34, as against 23 for the previous year. For the fourteen years ending with 1897 there were 488 deaths in this state from this disease.

Table No. 9 gives the mortality for the past fourteen years from scarlet fever, by age periods, with totals. It is unfortunate that our statistics do not cover a longer period, for we have every reason to believe, judging from the reports of a generation ago, found in medical journals and transactions of medical societies, that the mortality from this disease was very much greater then than in recent years.

Were it not for the mild cases, sometimes not even recognized by the family and to which a physician is not called, this disease might be practically obliterated. A severe case is isolated and proper care taken that the infection is not spread; but the mild, walking cases scatter and perpetuate the disease.

Like diphtheria, cholera infantum, measles, whooping cough, and some other of the infectious diseases, scarlet fever very largely seizes children for its prey. For the fourteen

years given, over 46 per cent of all the deaths from scarlet fever were in children between the ages of one and five; over 26 per cent from five to ten; 9 per cent from ten to fifteen, and over 8 per cent under one year of age.

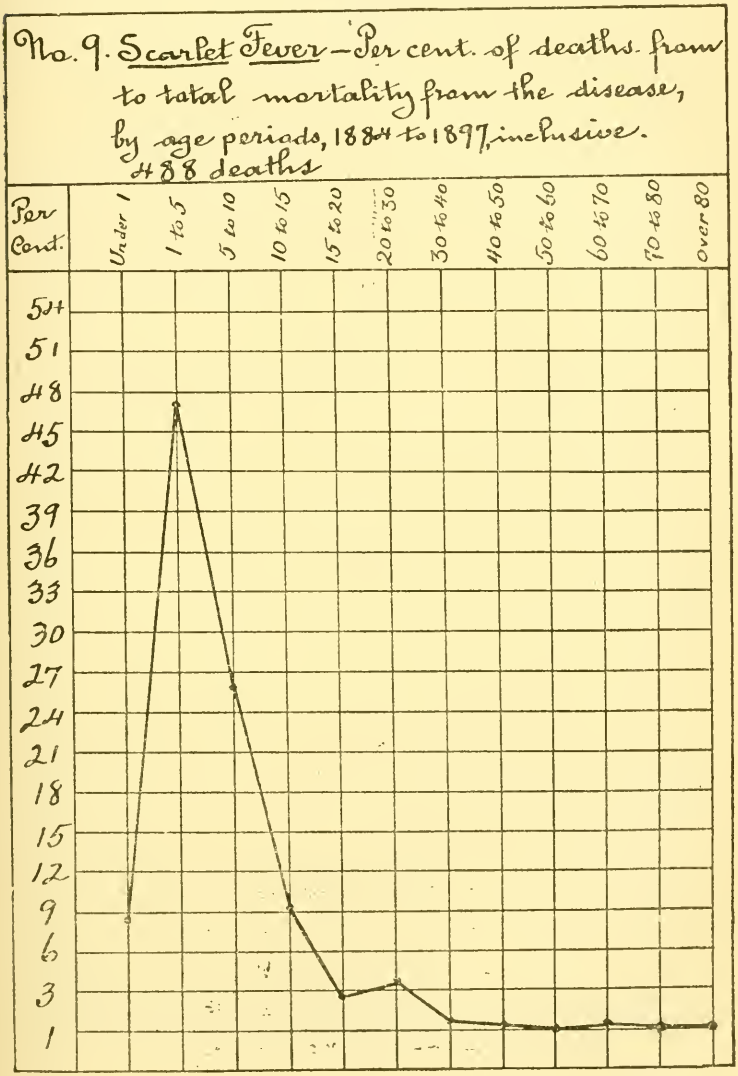


TABLE No. 9.

Scarlet fever, deaths from, by age periods, from 1884 to 1897, inclusive.

YEARS.	WHOLE NUMBER.				AGES.											
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884.....	52	26	26	....	7	20	12	8	1	4	.....	.....	.....	.....	....	....	..
1885.....	53	22	31	....	5	30	11	4	1	1	1	.....	.....	.....	....	....	..
1886.....	21	11	10	....	1	8	9	1	.....	1	.....	.....	.....	.....	....	....	1
1887.....	26	11	15	....	5	10	3	6	.....	2	.....	.....	.....	.....	....	....	..
1888.....	34	18	16	....	5	16	5	3	2	.....	1	1	.....	1	....	....	..
1889.....	18	6	12	....	4	7	3	2	1	.....	.....	.....	.....	.....	....	....	1
1890.....	16	8	8	....	2	10	1	1	.....	2	.....	.....	.....	.....	....	....	..
1891.....	13	6	7	....	1	7	4	1	.....	.....	.....	.....	.....	.....	....	....	..
1892.....	27	14	13	....	2	12	10	2	.....	1	.....	.....	.....	.....	....	....	..
1893.....	52	31	21	....	2	25	16	1	1	4	1	1	.....	.....	....	....	1
1894.....	61	29	32	....	3	27	22	5	4	.....	.....	.....	.....	.....	....	....	..
1895.....	58	21	37	....	3	30	13	4	2	4	2	.....	.....	.....	....	....	..
1896.....	23	7	16	....	.....	11	6	4	.....	1	1	.....	.....	.....	....	....	..
1897.....	34	12	22	....	1	15	14	3	.....	.....	.....	.....	.....	.....	....	....	1
Total ...	488	222	266	....	41	228	129	45	12	20	6	2	.....	1	....	....	4
Per cent.	.....	45.49	54.51	....	8.40	46.72	26.43	9.22	2.46	4.09	1.22	.41	.....	.20	....	....	..

A glance at Diagram No. 9 shows vividly the age period, with percentage of deaths for each period, and emphasizes most emphatically that this is a disease almost wholly of childhood. It suggests the importance of protecting children against the infection of the disease by every means possible, particularly as the liability to contract it later in life is very slight.

MORTALITY BY SEASONS.

For the fourteen years ending with 1897, the largest number of deaths from scarlet fever reported for one month was in May, while the smallest number was in August. A general survey of the mortality by seasons shows that the death rate from this disease is somewhat greater in the colder months of the year, but in this respect is not very marked.

MEASLES.

During the past fourteen years there have been reported 316 deaths from measles. For the year 1897, 12 deaths were returned from this disease, a number considerably less than the annual average. It will be seen by a glance at the table, No. 10, that the mortality from measles is very fluctuating. The lowest number of deaths returned in a single year was in 1884, with three only; in 1890 there were only nine deaths returned, and in 1895 only seven, while the largest number to be returned in a single year was fifty-five, in 1888.

Being purely an infectious disease, the variation in the annual mortality is readily accounted for. The facility with which this disease is spread renders it one of the most difficult to control, especially since it is infectious even before a diagnosis can be made. For this reason it is probably more prolifically spread in the schools than any other disease, with the possible exception of whooping cough. Notwithstanding this fact its mortality among school children is exceedingly limited, as more than 73 per cent of the deaths from measles occurred in children under five years of age.

Of the so-called infectious and contagious diseases, the mortality from, in children under five years of age, is greatest

in whooping cough, while measles ranks second, and scarlet fever third.

A glance at Diagrams Nos. 9, 10, and 11 will graphically emphasize this assertion.

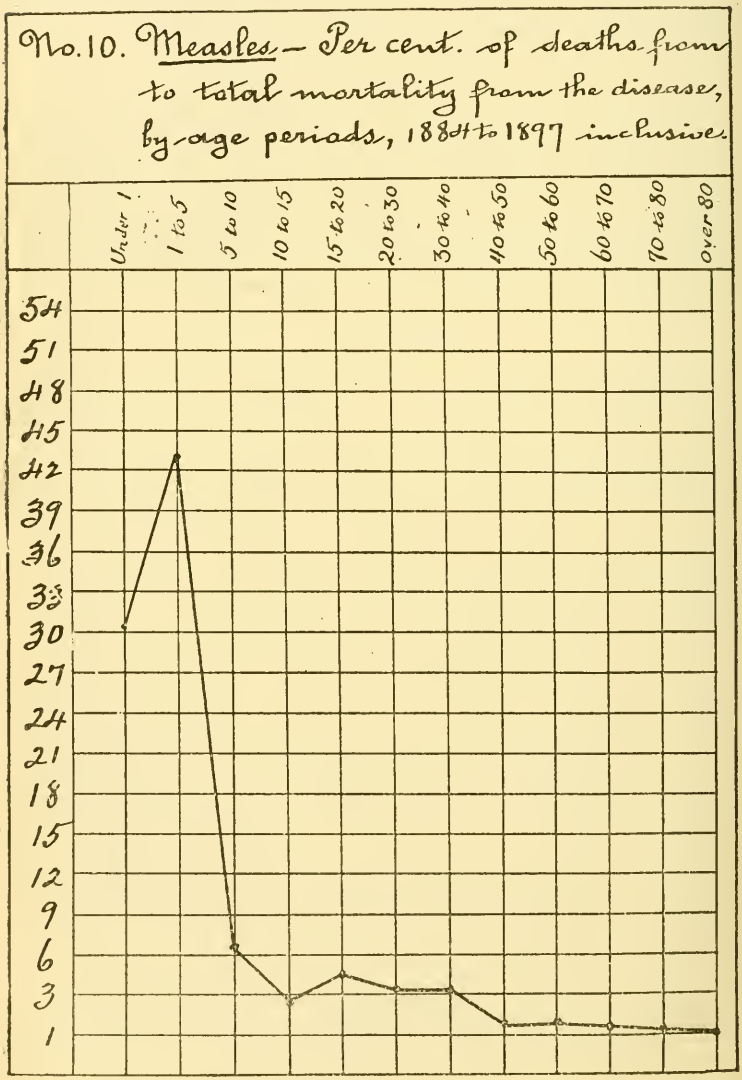


TABLE No. 10.

Measles, deaths from, by age periods, from 1884 to 1897, inclusive.

Years.	Whole number.				Ages.											
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884	3	2	1	..	1	1	....	....	1	....	....	....	....	...	...	...	...
1885	45	22	23	..	12	26	5	1	1	....	....	....	....	...	...	...	...
1886	18	10	8	..	5	13	....	....	....	....	....	....	....	...	...	...	...
1887	39	17	22	..	19	10	2	1	3	....	2	1	....	1	...	...	...
1888	55	27	28	..	14	20	6	3	2	2	5	1	1	...	...	1	...
1889	16	8	8	..	2	6	1	....	2	2	1	....	1	...	...	...	1
1890	9	6	3	..	5	4	....	....	....	....	....	....	....	...	...	...	...
1891	19	8	11	..	5	6	2	....	2	....	1	1	....	1	...	...	1
1892	24	11	13	..	7	11	....	1	1	3	....	....	1	...	...	...	...
1893	32	16	16	..	9	14	3	2	1	1	1	...	....	...	1	...	...
1894	14	9	5	..	3	8	1	1	....	....	....	....	....	...	1	...	...
1895	7	4	3	..	2	3	....	....	....	1	....	....	....	1	...	...	...
1896	23	10	13	..	6	13	1	....	2	....	....	1	....	...	...	...	...
1897	12	4	8	..	5	2	1	....	....	2	...	....	2	...	...	...	...
Total	316	154	162	..	95	137	22	9	15	11	10	4	5	3	2	1	2
Per cent	.....	48.73	51.27	..	30.63	43.35	6.96	2.85	4.74	3.48	3.16	1.26	1.58	.94	.63	.32	...

In measles the mortality in children under one year of age, for the period given in Table No. 10, was over 30 per cent of the total mortality from the disease; between one and five years, over 43 per cent; between five and ten nearly 7 per cent, while after the latter age there is a constantly diminishing percentage.

These facts are vividly illustrated in Diagram No. 10.

By seasons the mortality rates were greatest in the months of April, May, June, and July, and lightest in August, September, October, and November.

Regulations Controlling.

No circulars relative to the restriction and prevention of measles have been issued by the state board of health, but an order was promulgated and is in force requiring local boards of health to placard houses in which measles exist, as follows :

MEASLES.

Any person having measles, however mild the case may be, and all persons in a family where measles exists, *except those who have had the disease,* are forbidden to attend school or any public or private gathering, or to mingle with persons who have not had the disease.

Persons who have not had measles are prohibited from entering these premises.

All persons are strictly forbidden to remove this card without orders from the board of health.

Any violation of these regulations will be punished to the fullest extent of the law. Board of Health.

The above is the only order, other than that requiring physicians to report the disease to local boards of health, that has been issued by the state board of health regarding measles.

Greater precautions should be taken to prevent persons from contracting this disease, and when the public better understand the importance of isolation it will not be so difficult to enforce the regulations necessary to restrict its spread.

Some states have already issued circulars giving the public

information in regard to this disease, and we here quote from a circular issued by the state board of health of Virginia :

PRECAUTIONS AGAINST MEASLES.

Measles is an eruptive, communicable (contagious) disease most common in childhood. It is of such universal prevalence, and the attacks are often so mild, that it has come to be looked upon as a disease which is dangerous neither to life or health. This view is, however, entirely erroneous, death or permanent injuries of the body often resulting from the disease. It kills, in other words, about twice as many persons as scarlet, typhoid, typhus and other fevers and smallpox all put together. English sanitary authorities have recently pronounced measles to be "one of the most deadly of the preventable diseases that devastate the populace of Great Britain."

But it is not because of the deaths alone that measles is a dangerous disease. It often leaves the eyes, ears, bowels, and respiratory passages of the lungs in a weakened and diseased condition. Pneumonia, bronchitis, croup, and consumption far more frequently follow measles than is generally understood. Indeed, there is good reason for believing that measles may leave children predisposed to consumption of the lungs and bowels. Impaired eyes and ears often date from an attack of measles.

In view, then, of the mortality and disability with which this disease is justly chargeable, and of the fact that preventive measures have been so generally adopted in the case of these other diseases which do so much less harm, can we longer afford to regard with indifference this serious menace to the life and health of the rising generation ? "Measles and its death toll" in this country, as abroad, may well be said to have become a question of national importance.

PERSONS LIABLE TO MEASLES.

Measles is most commonly seen in the young, although any person who has not had the disease is liable to contract it. Very few persons escape it until adult life. Second attacks have been quite frequently observed of late years, and it has

even been known to occur a third time. It is very severe in adults, and has proved extremely fatal in military camps.

PERIODS OF INCUBATION AND INFECTIOUSNESS.

The least period required to develop the disease after exposure is four days; the average period is nine or ten days; the greatest is fourteen days.

The infectious period is from the appearance of the earliest symptoms until convalescence is completely established. The catarrhal stage preceding the eruption, in which there is cough and running from the nose, is very infectious, and the fine, bran-like scurf, which is shed in great quantities often by the skin, is full of specific poison.

HOW MEASLES SPREADS.

The specific poison of measles seems to be in the skin and in the discharge from the mouth and nose. Exposure to the presence of the sick and convalescent or to infected bedding, clothes, carpets, curtains, books, or toys is the means of spreading measles. A person visiting a case of measles may readily carry the germs in his clothing and convey the disease to others.

GENERAL PRECAUTIONS.

Measles may be avoided by sending children from home when an epidemic prevails, by keeping them from day and Sabbath schools, and by isolating the patients, thus preventing all communication with well children.

Quarantine should extend to fifteen days from the last exposure to infection and until complete recovery. Nurses should be quarantined with their patients.

PRECAUTIONS IN THE SICK ROOM.

1. It is safest to place all cases of measles under the care of a physician.

2. No persons who have not had the disease should be allowed to go into the room where persons are suffering from measles.

3. Persons who have come in contact with those suffering from measles should avoid attending public places of amusement or worship; they should not ride in cabs, omnibuses or railways until they have changed their clothes or had them disinfected by exposure to heat or soaking in boiling water.

4. In all cases the sick child or person should be separated from the family, either by removing the person affected, or removing the occupants from the sick person.

5. When the disease has broken out in a family on no account should the children be sent to school until such a time as there shall be no danger of their conveying the infection of the disease, as testified by a competent physician.

6. In rooms where persons are lying ill with the disease, the windows should occasionally be opened or kept constantly open, according to circumstances, so as to secure the escape of the poisoned air and the admission of fresh air from without. Fresh air itself is one of the most efficient remedies in the cure of all infectious diseases and the destruction of disease germs. Avoid drafts, and keep the patient well covered.

7. The sick room and everything about the sick person should be kept as clean as possible. All dirty linen should be immediately removed and put in cold water, and afterwards put into boiling water and well washed. Things that cannot be washed should, if possible, be sent, wrapped in a sheet soaked with a disinfectant solution, to some disinfecting establishment or placed in a hot oven.

8. Vessels used in a sick room should be well washed and rinsed out with some disinfectant, such as chloride of lime, carbolic acid or Condy's disinfecting fluid. Everything thrown into privies, water-closets, or drains should first be mixed with one or the other of these disinfectants.

9. Finally, we reiterate that no persons should be allowed in the sick room who have not had the disease; but if this is deemed imperative they should place themselves on the side of the bed towards which the current of air comes, to avoid the possibility of the exhalations or breath of the sufferer entering their mouth or lungs.

Those sick with measles need little medication, unless complications arise, but great care and good nursing. It is important to call in a physician at the start, and to obtain from him the fullest directions for the management of the case, and to follow these implicitly.

PRECAUTIONS DURING CONVALESCENCE.

Use every means to prevent taking cold, and until recovery is well established don't allow the patient to go upon damp ground without overshoes, or into the cold without being well wrapped up. For a violation of these precautions a life may be the penalty. If the eyes become sore and weak, as they often do during the attack, the room should be darkened and all use of the eyes forbidden for reading, sewing, or similar purposes until convalescence is well established.

Should a cold, bronchitis, or catarrh, sore eyes, or discharges from the ears or deafness remain after an attack of measles, the child should be continued under a physician's care, and every effort made by means of proper food and clothing to speedily restore it to its normal health. *A cold following measles should never be neglected.*

Since the eyes are often inflamed and usually weakened by an attack of measles, children should not be hurried to school until the strength of vision is well re-established. They should not read or study so long as the effort causes smarting or redness or watering of the eyes, or headache.

Remember, measles is a dangerous disease and to be avoided if possible; children should never be purposely exposed to it.

WHOOPING COUGH.

Whooping cough, a disease which is altogether too largely ignored and against which no concerted action has been taken to prevent its spread in this state, has been the cause of 396 deaths among the children of New Hampshire during the past fourteen years, a mortality considerably in excess of that caused by measles.

The greatest danger from this disease is in infancy. The record shows that nearly 70 per cent of the deaths above

cited occurred in children under one year of age, while 28 per cent were between one and five years of age, with practically no deaths later in life, only one death having been reported above the age period, 10-15.

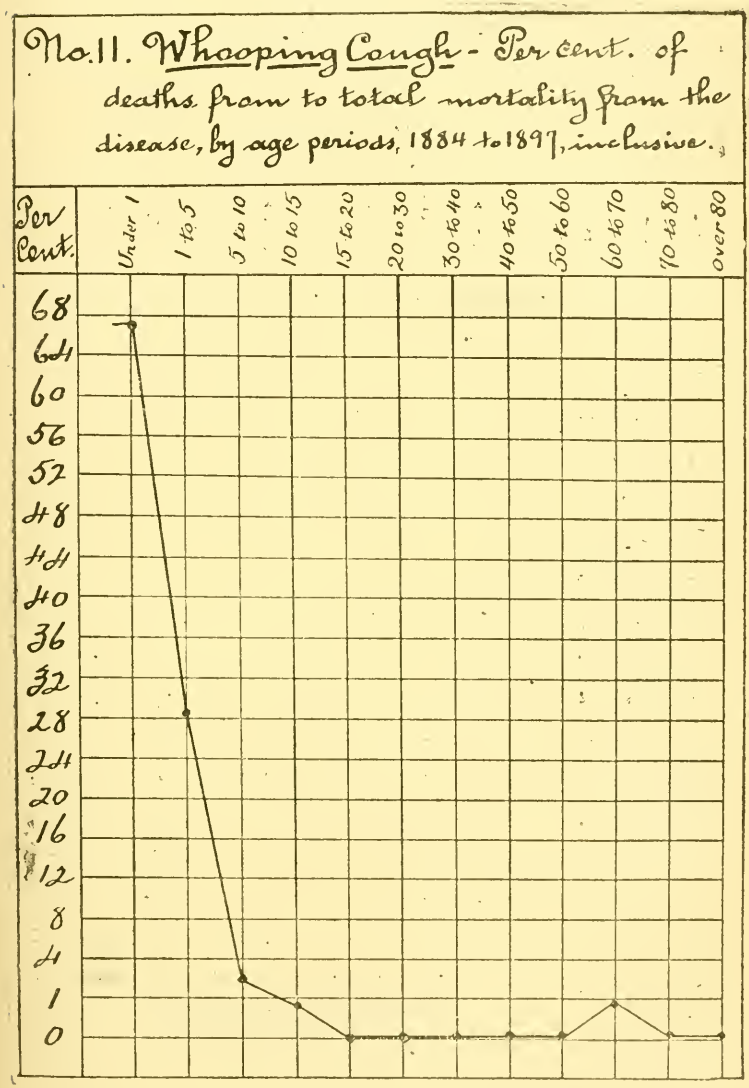


TABLE No. 11.

Whooping cough, deaths from, by age periods, from 1884 to 1897, inclusive.

Years.	WHOLE NUMBER.				AGES.												
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884	15	4	11	..	11	4	....	....	....	....	....	....	....	..	..	..	..
1885	25	11	12	2	16	8	1	....	....	....	....	....	....	..	..	..	..
1886	26	14	12	..	22	3	1	....	....	....	....	....	....	..	..	..	..
1887	21	8	13	..	11	9	1	....	....	....	....	....	....	..	..	..	..
1888	23	8	15	..	13	9	1	....	....	....	....	....	....	..	..	..	..
1889	47	23	24	..	32	14	1	....	....	....	....	....	....	..	..	..	..
1890	26	15	11	..	18	8	....	....	....	....	....	....	....	..	..	..	..
1891	27	15	12	..	25	2	....	....	....	....	....	....	....	..	..	..	..
1892	37	16	21	..	24	11	2	....	....	....	....	....	....	..	..	..	..
1893	23	12	11	..	13	9	....	....	....	....	....	....	....	..	..	..	1
1894	51	23	28	..	38	11	2	....	....	....	....	....	....	..	..	..	..
1895	26	11	15	..	19	4	2	1	....	....	....	....	....	..	..	..	..
1896	33	19	14	..	20	11	....	....	....	....	....	....	....	..	..	..	2
1897	16	5	11	..	7	8	....	....	....	....	....	....	....	1	..	..	..
Total	396	184	210	2	269	111	11	1	....	....	....	....	....	1	..	..	3

The chief lesson taught by this table is that every means possible ought to be adopted to protect infants from whooping cough.

MORTALITY BY SEASONS.

The death rate from whooping cough is greatest during the summer months, doubtless for the reason that cholera infantum and other disturbances incidental to warm weather are a considerable factor in the mortality rate.

CHOLERA INFANTUM.

During the years 1884-1897, inclusive, there were reported 5,103 deaths from cholera infantum in this state. This represents a terrible slaughter of infants, but even this is not all, for if to these figures were added the deaths from infantile diarrhea, dysentery, enteritis, entero-colitis, etc., the total would be considerably augmented.

Table No. 12 gives the deaths from cholera infantum, by years, sex, and age periods. It will be seen that more than 84 per cent of all the deaths under this head were among children under one year old, and that more than 99 per cent of all these deaths were in children under five years of age.

Every physician and sanitarian agrees that cholera infantum is largely preventable, being caused almost wholly by unsanitary foods and environments. In order that infants may stand a reasonable chance of withstanding this disease, they should be brought up under the best hygienic conditions.

The great fatality from cholera infantum occurs during the months of July, August, and September, as will be seen by Diagram No. 12, which illustrates exactly the percentage of deaths from this cause, by months, for the fourteen years represented in Table No. 12.

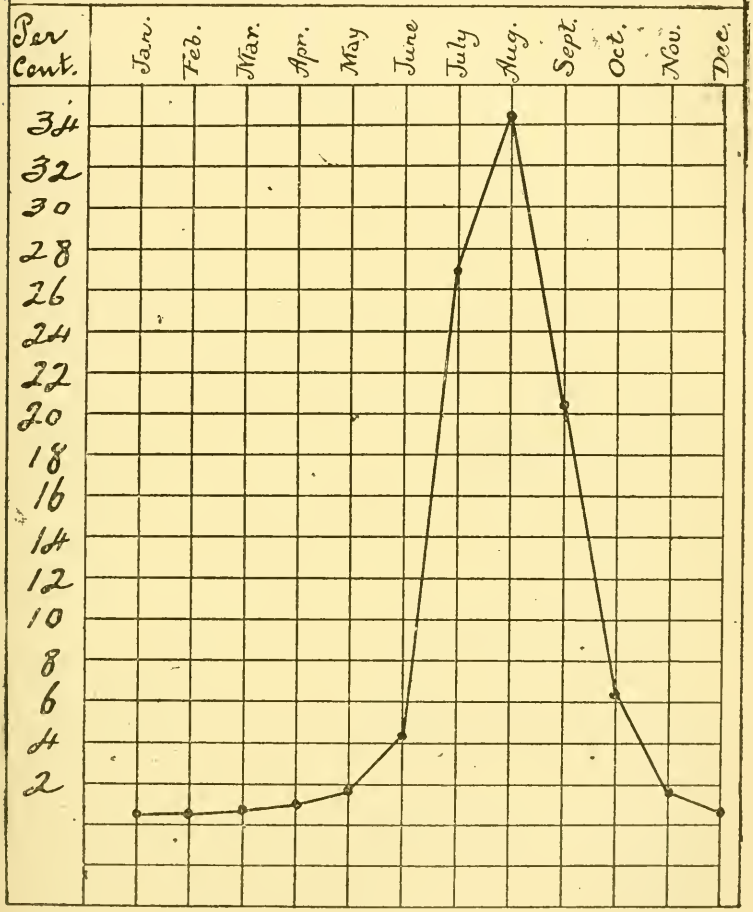
TABLE No. 12.

Cholera infantum, deaths from, by age periods, from 1884 to 1897, inclusive.

Years.	Whole number.				Ages.											
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884	266	146	119	*1	214	48	....	....	..	..	1	..	1	..	..	..	2
1885	219	110	109	....	186	33	....	....	..	..	....	..	....	..	..	..	..
1886	362	202	157	*3	283	77	2	....	..	..	....	..	....	..	..	..	..
1887	336	174	161	*1	284	51	....	....	..	..	....	..	....	..	..	..	1
1888	370	212	157	*1	298	70	....	....	..	..	....	..	....	..	..	..	2
1889	353	190	162	*1	297	54	1	....	..	..	....	..	....	..	..	..	1
1890	399	216	182	*1	343	52	4	....	..	..	....	..	....	..	..	..	..
1891	486	252	234	....	409	74	3	....	..	..	....	..	....	..	..	..	..
1892	366	193	173	....	320	41	4	1	..	..	....	..	....	..	..	..	..
1893	423	232	191	....	369	52	2	....	..	..	....	..	....	..	..	..	..
1894	400	226	174	....	334	63	2	1	..	..	....	..	....	..	..	..	..
1895	411	203	208	....	356	53	1	....	..	..	....	..	....	..	..	..	1
1896	392	215	176	*1	336	55	1	....	..	..	....	..	....	..	..	..	..
1897	320	171	149	....	271	47	2	....	..	..	....	..	....	..	..	..	..
Total	5,103	2,742	2,352	*9	4,300	770	22	2	..	..	1	..	1	..	..	..	7
Per cent	.....	53.91	46.09	....	84.26	15.09	.43	.04	..	..	.02	..	.02	..	..	..	..

* Classed with males.

No. 12. Cholera Infantum – Per cent. of deaths from, by months. 1884 to 1897 inclusive. 5,103 deaths



PNEUMONIA.

From 1884 to 1897 there were returned 8,602 deaths from pneumonia, that disease, next to consumption, being the most fatal in the state.

The mortality from pneumonia falls heavily upon infants and the aged. The period of life from comparatively early childhood to the maturity of adult life is more exempt from this disease than the earlier and later age periods. The aged are particularly susceptible to this disease, its fatality, in proportion to the number living of the same age period, being much greater than at any other time of life.

Pneumonia is a germ disease, or, rather, the inflammatory processes and conditions characteristic of this disease are induced by more than one variety of germs, which probably only gain admission to the lung tissues in sufficient force to produce the disease through some local lesion, or an impaired or enfeebled power of resistance on the part of the patient. There are doubtless many causes which contribute to this latter condition, chief among which is probably a low temperature, with a dry atmosphere. This certainly is fully corroborated by the fact that the disease is much more prevalent and fatal in the winter months than in any other season of the year.

These facts should carry with them the suggestion, especially to persons well advanced in life, that careful protection against the vicissitudes of our winter months is one of the most essential precautions against contracting pneumonia.

Statistics show that the disease has been rather on the increase than otherwise during the period covered by our reports. The heaviest mortality, however, was in 1892, when the epidemic of influenza was at its height, the effect of which was to increase the number of deaths from pneumonia. It is probable that the large death rate from this disease, which has been reported continually since 1889, is dependent indirectly upon the effects of influenza. In other words, it is probable that pneumonia in many cases follows as a sequel to influenza.

TABLE No. 13.

Pneumonia, deaths from, by age periods, from 1884 to 1897, inclusive.

Year.	Totals.	AGES.												
		Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884	436	51	48	3	3	6	27	23	30	36	50	97	54	8
1885	504	69	49	8	4	11	15	27	32	37	72	105	74	1
1886	466	57	38	13	6	13	17	24	29	49	68	92	53	7
1887	556	68	33	7	5	13	28	32	40	48	89	121	68	4
1888	628	67	45	6	10	19	40	49	51	62	67	123	81	8
1889	582	61	50	8	12	17	29	36	40	48	98	100	79	4
1890	703	73	48	9	10	11	35	46	45	79	106	127	107	7
1891	673	73	43	15	6	11	43	31	38	73	110	126	95	9
1892	890	77	49	13	6	12	41	61	60	95	147	190	128	11
1893	685	86	65	15	5	15	36	39	55	60	95	120	88	6
1894	633	88	62	13	4	11	29	38	48	63	87	103	83	4
1895	639	69	62	11	8	16	27	32	46	57	101	127	74	9
1896	557	103	96	8	5	10	22	29	35	34	68	82	63	2
1897	650	122	82	13	7	9	22	36	33	56	78	100	87	5
Total. .	8,602	1,064	770	142	91	174	411	503	582	797	1,236	1,613	1,134	85

Table No. 13 shows the number of deaths annually from pneumonia since 1884, by age periods, with totals. Of the deaths returned from this disease, a little over 48 per cent were males, and a fraction over 51 per cent females.

BRONCHITIS.

Of the diseases affecting the respiratory organs bronchitis ranks second to pneumonia, there having been reported during the past fourteen years 2,050 deaths from acute bronchitis, 909 males and 1,139 females.

Like pneumonia, this is a disease essentially of infancy and old age, it being especially severe in infants under one year of age. As far as its fatality is concerned, both by age periods and seasons, it runs almost parallel with pneumonia, and might in this respect be considered almost as another phase of that disease. It is governed by practically the same conditions, and, therefore, the same precautions should be exercised in its prevention.

Table No. 14 shows the mortality from acute bronchitis from 1884 to 1897, inclusive, by years, sex and age periods. In the matter of seasons the mortality was greatest in January, March, February, April, and December, and although deaths were reported at all seasons of the year, the mortality is relatively light during the summer months.

INFLUENZA.

When epidemic influenza struck the state, in 1890, it is probable that a majority of the physicians had never before seen the disease in epidemic form, and many did not recognize its nature for quite a period after it had invaded the state. For a time it went under the term "la grippe," and is even now so called by some. The disease, however, while regarded as new by some, is as old as history and many times has appeared as an epidemic in all parts of the world.

While the mortality is small in proportion to the number of persons attacked, it is far from being a disease that can be ignored. This statement will be accepted as true when it is

TABLE No. 14.

Bronchitis, deaths from, by age periods, 1884 to 1897, inclusive.

Years.	WHOLE NUMBER.				AGES.												
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884....	79	35	44	.....	15	8	1	1	....	5	5	3	10	4	13	13	1
1885....	108	41	67	.....	28	12	2	1	....	2	4	1	3	10	19	25	1
1886....	81	39	42	.....	16	14	2	1	....	4	2	2	2	7	12	19	....
1887....	114	56	58	.....	31	22	3	.....	.....	.....	.....	2	8	7	25	15	1
1888....	142	64	77	*1	39	21	3	....	3	4	5	3	7	9	25	21	2
1889....	127	50	77	.....	28	28	1	.....	.....	4	.....	8	12	12	15	19	....
1890....	194	89	105	.....	48	17	2	2	1	6	3	5	12	22	29	46	1
1891....	162	72	90	.....	49	12	4	....	1	11	3	3	7	17	27	26	2
1892....	217	95	122	.....	48	20	2	1	1	3	4	9	14	30	53	30	2
1893....	161	73	88	.....	62	25	2	2	....	4	3	3	9	7	21	21	2
1894....	163	72	91	.....	58	32	....	....	3	5	2	5	6	6	23	23	....
1895....	165	60	105	.....	48	28	1	1	2	6	5	1	11	13	24	23	2
1896....	136	62	74	.....	45	31	2	1	....	1	2	2	9	11	13	18	1
1897....	201	101	99	*1	73	48	5	1	....	4	6	.....	12	15	22	13	2
Total.	2,050	909	1,139	*2	588	318	30	11	11	59	44	47	122	170	321	312	17

* Classed with males.

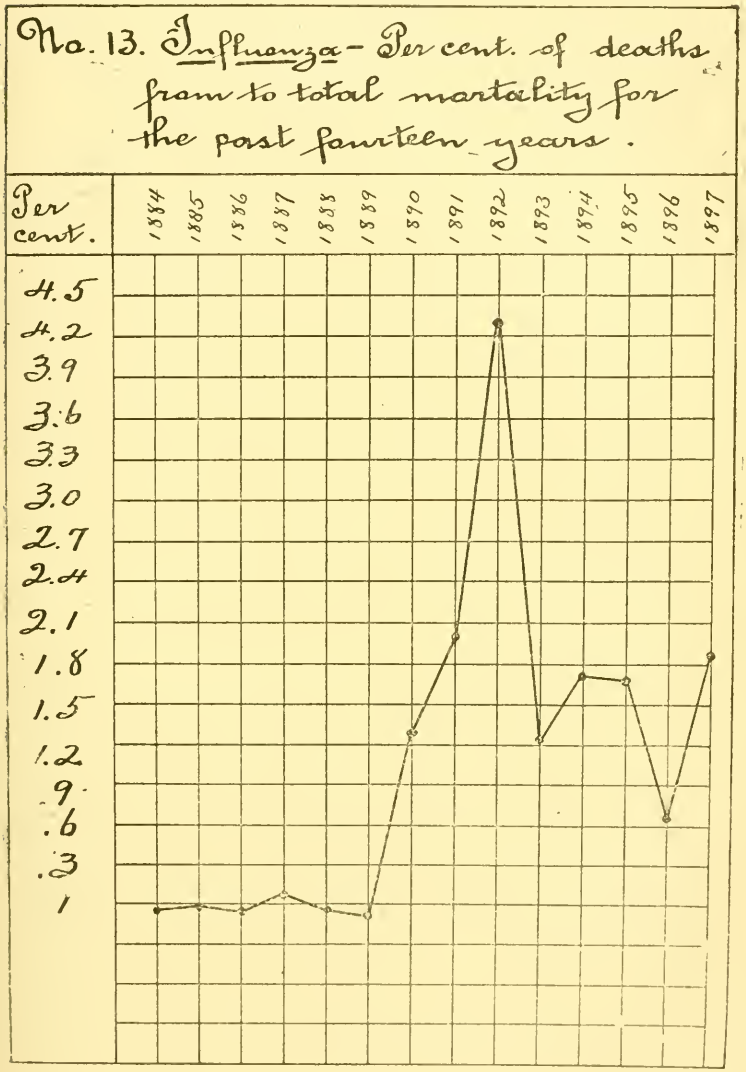
TABLE No. 15.

Influenza, deaths from, by age periods, 1884 to 1897, inclusive.

YEARS.	WHOLE NUMBER.				AGES.											
	Totals.	Males.	Females.	Unknown.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.
1884....	3	2	1	.....	1	.....	....	....	....	....	.....	1	.....	.....	.....	1	....
1885....	6	2	4	.....	1	.....	....	....	....	....	.....	.....	.....	1	2	2	....
1886 ...	5	3	2	.....	4	.....	....	....	....	....	.....	.....	.....	.....	.....	1	....
1887....	9	4	5	.....	2	.....	....	....	....	....	.....	.....	.....	.....	2	5	....
1888....	6	2	4	.....	2	.....	....	....	....	....	.....	.....	.....	1	2	1	....
1889....	4	1	3	.....	3	.....	....	....	....	....	.....	.....	.....	.....	1	.....	.....
1890....	95	45	49	*1	14	7	2	1	1	9	1	6	8	5	24	17	....
1891....	143	64	79	.....	15	16	3	....	1	....	4	2	10	26	33	31	2
1892....	331	144	187	.....	26	16	2	2	3	6	10	11	17	49	87	100	2
1893....	91	47	44	.....	9	6	1	1	3	2	2	6	3	10	22	25	1
1894....	121	44	77	.....	5	3	1	1	4	3	4	4	9	22	34	30	1
1895....	121	62	59	.....	10	4	....	2	1	5	2	4	10	10	40	33	....
1896....	47	16	31	.....	2	.....	....	1	2	4	.....	2	1	10	12	12	1
1897....	130	57	73	.....	15	2	1	2	1	3	5	9	9	15	40	27	1
Total .	1,112	493	618	*1	109	54	10	10	16	32	28	45	67	149	299	285	8

* Classed with males.

known that during the period covered by this report there have been from this disease 1,112 deaths in the state of New Hampshire, 493 males and 618 females. Most of these deaths



have occurred since 1890. The largest number of deaths from this disease in a single year was in 1892, with 331, while in 1897 there were 130 deaths, showing that at the close of the latter year the epidemic was by no means exhausted.

Table No. 15 shows the number of deaths from this disease since 1884, by years, sex, and age periods, with totals.

Diagram No. 13 is a remarkably graphic one, showing the eccentric fluctuations of influenza for the period given.

Neither the table nor the diagram illustrates fully, however, the effect of the epidemic at its onset, because its force was largely expended on the sick, the fatal results of which were recorded under other diseases. As an illustration of this assertion attention is called to Diagrams Nos. 1 and 2, under consumption, where the effect of influenza will be seen in the sharp angle of increase under the year 1890, while in pneumonia the number of deaths was increased in 1890 from 582 in the previous year to 703 in the year mentioned.

It is possible that a study of other diseases will also show an increased mortality as a result of epidemic influenza.

As in pneumonia, the greatest mortality from influenza was during the winter months, and also like pneumonia, was exceedingly fatal to infants and the aged.

STATISTICS OF OTHER DISEASES.

In the foregoing we have given some statistics of and briefly considered the chief so-called communicable diseases—diseases against which the means of restriction and prevention are more or less well understood.

Statistics from which similar deductions can be made with respect to mortality in its various phases may be found in the Registration Report, so that any one who wishes to study any particular disease in detail will find therein valuable statistical material relating to every reported disease and other cause of death.

THE USE OF DIPHTHERIA ANTITOXIN.

Reports from authorities in the United States and Europe of reliable standing, show a very large number of cases of diphtheria in which the anti-diphtheritic serum has been employed, demonstrating beyond successful contradiction its great effect in reducing the mortality from this disease. It seems to us that there can be no longer any doubt upon this point. Hospital records, as far as we know, without an exception where antitoxin has been thoroughly tried show a very marked reduction in the mortality rates of diphtheria, as compared with an equal number of cases received and cared for under similar circumstances before the employment of this treatment.

The report of the medical officer in charge of the hygienic laboratory of the United States Marine Hospital Service states that the published reports of one hundred physicians and twenty boards of health for the year 1895 and a portion of 1896 show 7,021 cases of diphtheria treated by antitoxin, with 704 deaths, a death rate of 10.6 per cent, as compared with 2,936 cases of diphtheria occurring synchronously, with 1,110 deaths, a mortality rate of 39 per cent.

Since these statements were gathered a lower death rate under the use of antitoxin has often been recorded, chiefly through the knowledge that to obtain the best results the serum must be used as early as possible in the development of the disease. The report of the Harper Hospital, Detroit, during the year 1896, shows that there were admitted 112 cases of diphtheria, 12 being subjected to intubation, 6 to tracheotomy, with only 5 deaths, 3 of which were dying when brought to the hospital. In 1897 there were 90 cases of diphtheria in the hospital with 6 deaths. Antitoxin was used both years.

This low death rate led the Detroit board of health* to

* Louisville Medical Journal.

decide to furnish diphtheria antitoxin gratuitously to patients too poor to pay for it, this also including patients under charge of the city physicians, poor patients at Harper hospital, sent there by the board of health, at the Woman's hospital, and at the Protestant Orphan asylum. This was done from May 1, 1896, and the number of patients so treated up to February 28, 1897, close of the official year, was as follows :

	Cases.	Deaths.	Mortality Rate.
With antitoxin	374	47	12.56 per cent.
Without antitoxin . . .	467	163	34.90 per cent.

In continuation of this series of observations are the following results from figures not yet made public, but kindly furnished me by the board of health. From March 1, 1897, up to December, the following cases came under either the notice or care of the board :

	Cases.	Deaths.	Mortality Rate.
With antitoxin	305	32	10.49 per cent.
Without antitoxin . . .	632	192	30.39 per cent.

It should, however, be borne in mind that the variation in hospital statistics may be due largely to the condition of the patient when admitted, as it is conceded that in advanced cases the antitoxin may be of little or no benefit.

A Russian report on this subject also contains valuable evidence. A special committee of St. Petersburg physicians, occupied last year with the investigation of this subject, obtained data from physicians who had used the serum, and great care is said to have been exercised in the entire investigation. In 44,631 registered cases in which the serum was used, the mortality was found to be 14.6 per cent, while in 6,507 cases where the serum was not employed, 34 per cent of the cases ended fatally. It is said that the results are so marked that confidence is expressed in the treatment even by the peasants, and that eleven Russian laboratories are engaged in the production of the serum.

The governments of Bosnia and Herzegovina have made the use of diphtheria antitoxin compulsory, both as a curative

and a preventive. The great value of this treatment is set forth in almost all current medical journals. The Oklahoma *Sanitary Bulletin* says: "We think the time has come when physicians are liable to just criticism who fail to use antitoxin." While this is an advanced position to take, we support that view of the matter, and recommend its use, especially in the early stages of the disease and when other conditions do not contra-indicate its employment. We believe that the prompt use of antitoxin within the first three or four days after the invasion of the disease would save many lives. Parents should be impressed with the very great importance of calling a physician as soon as this disease is suspected to exist in any member of the family.

In the report of Dr. Henry Kenwood, Medical Officer of Health, St. Mary, Stoke Newington, the following observations occur: "Ample time has now been afforded for testing the efficacy of 'antitoxin' in the treatment of diphtheria, and the opportunities have been all too frequent during the past six or seven years. Good reports upon its employment come from all quarters of the globe, and the very few contrary statements which have come to hand have either been based upon inadequate trial or improper employment of the serum. The remedy is too generally used as a *dernier ressort* after the patient is moribund or requires tracheotomy, and even then it is notorious how rapidly the distressing symptoms, as a rule, melt away. It is thought by some that although it does such a great deal of good during the acute attack, it does not diminish, even if it does not increase, the subsequent tendency to fatal heart failure. I know of no convincing statistics in support of this point, but it is conceivable that if antitoxin is the means of bringing a patient over the acute attack, it may appear to increase the number of deaths from subsequent heart failure from the circumstance that it enables many to reach the dangerous period following the acute attack, who otherwise would have died beforehand."

The astounding value of antitoxin* as a remedy for diphtheria has now for some considerable time been proved beyond the possibility of cavil. Even those conservative practitioners

* Pediatrics.

who always look upon everything new with an eye of distrust, and regard each fresh remedy as a fad, have at last been compelled to give in, and freely acknowledge the great merits of antitoxin. According to the *Lancet,* The Imperial Statistical Office has recently published the returns of the causes of death in the towns of Germany of more than 15,000 inhabitants, from the year 1885 to 1895. These returns show that from 1885 to 1894 there were 119,038 deaths from diphtheria or croup, the average number thus being 11,904 per annum. The maximum was reached in 1893 by 15,860 deaths, and the minimum in 1888 by 9,934 deaths. In 1895, when diphtheria antitoxin was first used on a large scale, the deaths went down to 7,266. The diphtheria death rate was 10.69 per 10,000 in the preceding ten years and only 5.4 in 1895, so that the mortality had fallen 49.48 per cent. Of 100 deaths, 4.53 were caused by diphtheria from 1885 to 1894 and only 2.53 in 1895. The decrease of the death rate from diphtheria was almost uniform in every district of the empire. The prevalence of the disease, however, was about the same as it had been for the last twenty years, and it is therefore unquestionable that the serum treatment has had the effect of producing a remarkable improvement. Dr. Barbier reports great success in the treatment of pure diphtheria in France by intubation. Out of fifty-four cases of pure diphtheria, thirteen of which were laryngeal cases, intubation was performed with the result of saving life in each instance.

The *International Medical Annual* for the current year makes this statement: "If the profession and public once grasp the truth, that, with rare exceptions, no child ought to die of diphtheria, it is probable that the actual mortality will become very low."

The health commissioner of Denver, Col., Dr. William P. Munn, gives the following mortality statistics with reference

to the treatment of diphtheria in that city, with and without antitoxin :

	Year.	Cases.	Deaths.	Mortality per cent.
Before antitoxin was discovered	1888	.....	120	.....
	1889	233	109	46.5
	1890	720	277	38.6
	1891	468	175	37.4
	1892	300	89	29.7
	1893	318	106	33.3
	1894	233	71	28.7
Antitoxin introduced	1895	248	40	16.1
Treated with antitoxin	.....	123	9	7.3
Treated without antitoxin ..	.....	125	31	25.1
	1896	246	19	7.7
Treated with antitoxin	.....	107	7	6.5
Treated without antitoxin...	.....	139	12	8.7
	1897	297	43	14.5
Treated with antitoxin.....	.....	147	6	4.1
Treated without antitoxin...	.....	150	37	24.6

Dr. John H. McCollom, in an able paper read at the last meeting of the Massachusetts Medical Society, on "Antitoxin in the Treatment of Diphtheria,"* states his conclusions as follows :

From an examination of mortuary statistics, both in this country and in Europe; from a clinical study of 4,200 cases of diphtheria, it seems to me that the following conclusions are absolutely correct :

* Vide The Boston Med. and Surg. Journal, Aug. 18, 1898.

1. That the death rate of diphtheria has been reduced to a remarkable degree by the use of antitoxin.

2. That in order to derive full benefit from this agent it is important that it should be given in large doses early in the course of the disease.

3. That antitoxin should be frequently repeated, until the characteristic effect is produced on the diphtheritic membrane.

4. That antitoxin does not cause albuminuria, and that it has no effect in producing heart complications in this disease.

5. That the physician who does not use antitoxin in the treatment of diphtheria fails to do his whole duty to his patient.

In a recent address before the Sanitary Institute of Great Britain Dr. G. Sims Woodhead said :

"For the last three or four years most of us have been carefully noting the results of the antitoxin treatment of diphtheria. For my own part, I may state at once that I am satisfied that where antitoxin is given early enough and in sufficient quantity it is practically a specific in the treatment of diphtheria. It may be asked, why then does not diphtheria disappear from amongst us ? To those who have studied the genesis of the disease the answer is simple enough. Although antitoxin can never take the place of improved sanitary conditions in doing away with the breeding places of the diphtheria bacillus outside the human body, it may be looked upon as an almost perfect protective against the action of the diphtherial poison in the body. As regards the curative action of antitoxic serum, I have little new to tell you beyond the fact that during the year 1897 the death rate from diphtheria in the hospitals of the Metropolitan asylums board fell to a still lower figure than in any previous year, the mortality last year being only 17.5 per cent, a figure that at one time would have been looked upon as absolutely chimerical, taking into consideration the fact that so many of the cases have already been under treatment for considerable periods, and are only sent into hospital either for surgical interference, or because there remains little hope of recovery outside.

Amongst cases of post-scarlatinal diphtheria there has been a still greater falling off in the mortality. At one time something like 60 per cent of the convalescent scarlatinal patients who afterwards contracted diphtheria succumbed. Now under the antitoxin treatment, in one hospital of which I have statistics the death rate is about 2 per cent, while in another nearly 100 cases were treated last year without a single death.

"Now, gentlemen, does not all this point in one direction, and in one direction only? Wherever there is an outbreak of diphtheria the first thing to be done is to inject not only the patient with a curative dose, but all who can possibly be exposed to infection with a protective dose of antitoxin. This is the only logical outcome of the experiments and experience of the last few years. . . . Now that antitoxin is so much more potent than it was at one time and that the conditions of preparation and storage have been so much improved, most of the objections to the administration of protective doses have been removed, and the advantages to be gained are so great that I look forward with confidence to the time when this method of assisting sanitary administrators will be received with the favor that it deserves. It is a step which may be taken at once as soon as there is even a suspicion of the presence of the disease, the earlier the better; it is not even necessary to isolate immediately, as all those injected are at once protected. It does not in any way interfere with the carrying out of sanitary improvements, and although it does not ultimately take the place of these improvements it protects the inmates of the infected houses whilst the improvements are being carried out."

The experience of the Massachusetts State Board of Health, in the production and use of antitoxin in diphtheria, further corroborates the favorable opinion everywhere expressed when this agent has been carefully and conscientiously used. The board produces its own antitoxin, and during the three years ending March 31, 1898, distributed 9,611 bottles of the serum, each package representing 1,000 antitoxin untis.

An increase in the demand for this agent is shown by the

fact that in 1896, 1,724 bottles were distributed; in 1897, 3,219; and in 1898, 4,668 bottles. The increased demand was owing to the greater favor with which the agent was received by physicians, rather than to any increase in the prevalence of diphtheria. The board says :*

"Very little is now heard in opposition to the use of antitoxin as compared with that which was manifest during the first year after its introduction. The figures presented in this report speak for themselves so far as the reduction which has taken place in the fatality of diphtheria is concerned. The fatality in the pre-antitoxin period, as shown in past reports of this board, was 28.3 per cent for the period of four years, 1891-94, while during the years 1895-97 the general fatality from diphtheria throughout the state was only 16.

"In the last annual report a summary of the statistics of fatality from diphtheria in certain other states and countries was presented, comprising about 20,000 cases. Very much additional testimony of the same kind might be added this year, the accumulation of which all tends to show the value of diphtheria antitoxin. The publication of such material, however, is now scarcely necessary, since the medical profession as a whole may be said to have adopted the remedy as one of the most important additions to the list of therapeutic agents. The following statement, published in the annual report for 1896, applies equally to the results of the year 1897 :

"It is quite plain that a comparison of the fatality of cases treated with antitoxin with the general fatality of cases of diphtheria previous to the introduction of this therapeutic agent, or even with cases not treated with antitoxin, which occurred at the same period with those so treated, does not do justice to the merits of antitoxin, for the reason that such a comparison must be made between two groups or classes of cases which are not strictly comparable, since one contains a larger and the other a smaller percentage of severe cases. That is to say, the general run of cases treated with antitoxin by physicians in private practice, and especially of those sent

* Annual report of the State Board of Health of Massachusetts, 1897.

to hospital, must necessarily be a selected class, in which the percentage of severe cases is greater than it is in the whole number of cases of diphtheria occurring or reported in a given community.

"It has been urged, and with some degree of reason, that the diminution in the fatality from diphtheria is partly due to the introduction of bacterial diagnosis by means of cultures from the throat, whereby mild cases of illness are shown to be cases of true diphtheria which would otherwise have passed unnoticed. But this statement is in some measure offset by the fact that a considerable number of cases which might have passed for diphtheria before the days of bacterial diagnosis are now classed as 'negative.'

"The present report gives support to the belief that the value of this argument has been over-estimated, since the cases in which cultures were made are here separated from those in which they were omitted, and the fatality in each group differs but slightly. This fact does not, however, in the least degree undervalue the importance of having a careful diagnosis made by means of cultures in each case, either before the administration of antitoxin, or as soon as possible after the beginning of treatment.

"The most important lesson which is taught by these returns is the necessity of *early administration of the antitoxin in each and every case.*

"Out of 294 cases in which antitoxin was administered on the first day of illness there were only 13 deaths, or 4.4 per cent; and out of 711 cases treated during the first two days of illness there were only 46 deaths, or 6.5 per cent; while the deaths in 156 cases in which antitoxin was not employed until the sixth and seventh days and later were 30, or 19.2 per cent, the patients in the former instances having a chance of living three times as great as in the latter."

INSPECTION OF SUMMER RESORTS.

Concord, N. H., September 30, 1898.

Irving A. Watson, M. D., Secretary State Board of Health, Concord, N. H. :

Dear Doctor,—I have the honor to report an inspection of some of the prominent summer resorts in the White Mountains. Our board has always taken occasion to inspect the hotels in this region, believing them to be public buildings, and therefore, this may properly be considered as a part of our duties. This work is undertaken in the interest of the state, and not in a spirit of criticism. I am happy to report that in every instance I was most cordially greeted by the managers and proprietors.

It is now a well established fact that the summer visitor and tourist has become critical on matters pertaining to sanitation, and the managers of hotels and boarding-houses well understand that a single case of preventable disease will cause an exodus of visitors from a house almost as quickly as a conflagration.

It seems that the present season has been a popular one for summer visitors in the mountains, as all the principal hotels report having had a most excellent season, with full houses from early in July until the middle of September.

The Fabyan House was remodeled, the plumbing was largely taken out and replaced, bath rooms were added, and considerable work done upon the grounds about two years ago. It is in thoroughly good condition and has modern improved fire escapes, which were added to the house at that time. The water supply and drainage are of the best, and are systematically and intelligently looked after and maintained. When the house was remodeled, the improvements were made in the bath rooms, which are thoroughly appreciated by the guests.

The Mount Pleasant House has been entirely remodeled within the last few years, improved water supply added, the grounds laid out anew, a large addition to the house with suites of rooms with bath rooms, considerable new plumbing having been added. Fire hydrants inside and outside the house have been put in, but no fire-escapes beyond those of ordinary ladders are to be found. The arrangement of the house is such that many of the most exposed portions are easily reached from the higher to the lower portions of the roof of the house, so that there is a good chance for escape to the lower portions of the house, and from there to the ground. The house is well provided with stairways, having no less than three distinct passages in the main house; yet we all know that sometimes these passageways, while affording exit, at the same time furnish the means of a draft that causes the spread of fire much more rapidly than would otherwise take place. The building is a good deal exposed, as railroads pass on either side, and on one side in particular the grade is very heavy and large engines are obliged to keep up a good deal of steam in order to go over the grade. The managers of the house are keenly alive to their interests, and will undoubtedly add fire-escapes before another season.

The Crawford House was remodeled two years ago, and it is sufficient to say of it that it is as deserving of our recommendation and approval as it was in 1886, when we made a full report upon that house. It has always been a popular resort for people going to the Mountains, has a first-class and never failing water supply coming from the mountains, but is dependent upon ladders for fire-escapes. It has several large and commodious stairways, widely separated, and at points where exit can be effected through large doors directly into the open air.

The house is located upon the divide between the Connecticut and Saco valleys near the gateway to the White Mountain Notch, with Mt. Webster and Mt. Willard towering high above on either side, while the small lakes constituting the head waters of the Ammonoosuc and Saco rivers are

located only a few yards away, and are only on a lower level of a few feet.

The sewage of the house is carried far beyond these lakes and every precaution is taken to secure healthful conditions as well as to repel and guard against anything unsanitary in its nature.

Wentworth Hall, in Jackson, long since acquired a first class reputation as a summer resort among the mountains. Its proprietor and manager, General Wentworth, gives it his personal attention and in many things it may be considered a model summer resort. It has a large and never failing water supply, an electric plant which serves for lighting and for power. The plumbing is a model for any institution, and the grounds have received a good deal of attention. It is deservedly popular and receives the confidence of the public. This house is excellently located, and the town of Jackson is entitled to a good deal of credit for their good work in entertaining summer visitors. The town has a population of from five to six hundred and entertains during the season many times its own population. It has been estimated that the town receives a patronage, the gross value of which is nearly or quite $175,000 per annum, and thus it becomes an object lesson to other towns in the state similarly situated. Without this patronage, there would probably be considerably less than one hundred in population, and the valuation of the town instead of being more than $175,000, as reported in the last New Hampshire Register, would be less than one half what it is now.

The men who have invested capital in this business in the town of Jackson are shrewd, painstaking people; keen observers of human nature, and are ever ready to cater to, and anticipate the wants and desires of the tourist, as well as the summer visitor. Its hotels are deservedly popular. This may be only the natural result of strict attention to business, yet the people of the town are entitled to great credit in the fact that they have made road-making a business, and I doubt if you can find in any town in the state, even having considerably more population, such fine roads as they have in this

little mountain town. The presiding genius over the road-making of that town has evidently made it a study, and in making the roads does it with the purpose of maintaining good roads, and not being obliged to repair them after every shower.

The Waumbek, and other hotels in Jefferson, are all in good condition. The Waumbek has been extensively enlarged, suites of rooms added, and many improvements have been made about the grounds and the house to make it a deservedly popular resort. The fact that it has been overflowing with guests for three months during the present season is sufficient testimony to show that the public appreciate the attempts on the part of the proprietors to anticipate the wants of their guests.

The sewerage of Jefferson Hill was planned and executed upon the suggestion and approval of the state board of health, and is as nearly perfect as can be expected. The sewerage of all these summer resorts has been developed to meet the wants and needs of all these places as temporary residences. They are not intended for occupation the year round, but they are safe to themselves and to the localities in which they are situated. Many of the sewers are too superficial for use in the winter, but as the houses are shut up, and there is no use made of these sewers during the winter, they are perfectly safe. Most of them deposit the sewage in very rapidly running water, little streams, yet they are never failing, and therefore in a local shower during the summer, the surplus water from the surrounding hills causes a large amount of water to flow through their banks, carrying a large amount of sand and soil, which, mingling with the sewage, seems to have the power of neutralizing decomposing substances so that there is no complaint from people living upon lower levels of the same brooks. This power of oxidization and germ destruction, by reason of brooks and rivers rising and falling rapidly, has much to do with water purification. This with the intense cold of our winters in the mountains, and the great surplus of water in our spring freshets, prevents a great deal of contamination along the banks of our natural water courses.

All the principal summer hotels have a watchman on duty nights, and watchman's electric clocks are in use to show the care and efficiency of the servants when on duty.

As most of these houses have a hydrant service, with a large water-supply, they might, with very little trouble, organize a fire brigade, having a competent chief that, with weekly drill, would at once inspire confidence on the part of the guests and insurance companies.

The railroad has been extended from Jefferson Meadows on the main line, by a branch to within a few rods of the Waumbek. In this connection, and in justice to the two great railway corporations that furnish transportation for the many thousand people that visit Northern New Hampshire, it is only proper to add that the management of these lines is fully cognizant of the great value of these mountain resorts to their roads. They believe in further development of our capacity to entertain summer visitors; would be glad to construct new branches of their roads to such points as would develop the business necessary for a return on the investment, and have done a great deal to make their stations and grounds attractive as well as comfortable.

The stations and grounds along the line of the Maine Central reflect much credit upon the management for their forethought in providing designs calculated to bring out the beautiful and the picturesque, and the agents, their families, and the section men, richly deserve the many words of commendation that are so often heard from passengers upon trains passing between Lancaster and Portland.

The Boston & Maine are remodeling and rebuilding stations, giving great attention to the laying out of new grounds, and clearing up roadbed and right of way. It is to be hoped that small margins of trees and shrubs along the banks of rivers and lakes may be ultimately converted into miniature parks. This can easily be done by removing the underbrush from the ground and trimming the trees, thereby allowing the passenger a brief glimpse of the beautiful views which nature has so lavishly bestowed upon New Hampshire.

Respectfully submitted,

GRANVILLE P. CONN, *President.*

AMERICAN PUBLIC HEALTH ASSOCIATION.

Report of the Twenty-Fifth Annual Meeting at Philadelphia, Pa., October 26-29, 1897.

BY ROBERT FLETCHER, PH. D., CIVIL ENGINEER, MEMBER OF THE NEW HAMPSHIRE STATE BOARD OF HEALTH, DIRECTOR OF THE THAYER SCHOOL OF CIVIL ENGINEERING, DARTMOUTH COLLEGE.

The twenty-fifth annual meeting of the American Public Health Association was held in Philadephia in response to an invitation from the mayor. Dr. Benj. Lee, chairman of the local committee of arrangements, remarked that when the association was organized there, twenty-four years ago, it was but a handful; today the infant has grown to the proportions of a giant.

The association has a membership exceeding 1,800, of which a large proportion are in the medical profession; but members of boards of health, civil engineers, professors in leading colleges, sanitary inspectors and other persons interested in the promotion of sanitary science, are gathered from most of the state of the Union, from Canada and Mexico, to consider questions of great importance in relation to the public welfare. A far reaching influence is exerted by the papers presented at the meetings and by the discussions, many of which are widely reported, and all of which are embodied in annual volumes of "proceedings," which now number twenty-two, and which comprise a great body of knowledge and information in various departments of hygiene. This voluntary organization now enjoys so large a measure of public esteem that cities strive for the honor of entertaining it. At this meeting the municipality of Philadelphia gave

them a banquet at which Mayor Warwick presided; the mayor also gave a reception at the city hall; the Woman's Health Protective Association of Philadelphia, the trustees of the University of Pennsylvania, the trustees and faculties of the Jefferson Medical College and Woman's Medical College, and the Academy of Fine Arts, gave entertainments. An excursion was arranged for a trip on the Delaware river and visits to the State Quarantine Station, and the disinfecting plant of the United States Marine Hospital Service. Special privileges and entertainments for the visiting ladies were provided by the prominent clubs and other organizations.

But nothing was allowed to interfere with the business of the association. Fifty-six papers and reports were on the programs and nearly all were read and discussed during the nine sessions held in four days. The aim and scope of this report will permit only the mere mention of the more important titles and summaries or abstracts of some parts of papers which have special interest and value to the people of this state.

At the opening session the resignation of the former secretary, Dr. Irving A. Watson, of Concord, N. H., secretary of the New Hampshire state board of health, was announced. Remarks were made expressing the highest appreciation of Dr. Watson's devotion to and his labors for promoting the interests of the association, and a committee was appointed to draft a resolution expressing the appreciation of the entire association of the splendid services rendered by Dr. Watson and regret at his resignation.

Formal Opening.

The formal opening of the meeting was begun by prayer by the Rev. Dr. W. N. McVickar. Dr. Benjamin Lee, in the absence of Governor Hastings, welcomed the visitors on the part of the commonwealth, and Mayor Warwick extended to them the hospitality of the city. The mayor referred feelingly to the life work of the late Dr. William H. Ford in the cause of municipal sanitation. The annual address of the president, Dr. H. B. Horlbeck, of Charleston, S. C., was then read by that officer.

President Horlbeck's Address.

Dr. Horlbeck said in part :

"The association has happily chosen Philadelphia as the place of its meeting, a city which for a century has held the proud distinction of being foremost and best in professional attainments; a city which has always been in the front rank of the noblest aspirations in a calling where the first requirement is an abnegation of personal and selfish consideration, which exacts devotion to the wants of mankind when they become sufferers. Along the century's diapason the great names of Rush, Wood, Chapman, Gross, Leidy, Jackson, Mitchell, and Mutter come down to us in consonant accord with the best and truest ideals of humanity. From these and other great worthies of this city the wisdom of the ages has been given to thousands of our colleagues, who have glorified their teachers by constant self-sacrifice and laborious loyalty to their alma mater. To Philadelphia we are under obligations for the establishment, during the first half of this century, of the best schools of medicine in our country. The lights in the sacred fane of medical lore have been kept constantly bright, and to-day Philadelphia is second to none in her great schools for the propagation of professional medical knowledge."

Referring to the objects of the association, the speaker said that from the earliest dawn of history we learn that the nomads, and later the denizens of cities, exercised care in removing from their surroundings the dangerous accumulations resulting from congregated habitations. From the use of the simplest methods, which gradually increased in scope as modes of living became more complete in character, the highest scientific knowledge is now demanded to meet the requirements of the great cities and peoples of the earth.

IMPROVED METHODS IN COMBATING DISEASE.

Speaking of the progress made in the study of disease, he said that the theories based upon the humors of the blood have given place to a knowledge of the denizens of the blood, which

are being recognized as surely as the flora and fauna of our fields. The microscope gives us the keynotes of our temporal welfare. Quoting from Pasteur :

"Whenever and wherever there is decomposition of organic matter, whether it be in the case of an herb or an oak, or worm, or whale, the work is exclusively done by infinitely small organisms. They are the important, almost the only, agents of universal hygiene; they clear away more quickly than the dogs of Constantinople or the wild beasts of the desert the remains of all that has had life; they protect the living from the dead; they do more if there are still living beings; if, since the hundreds of centuries the world has been inhabited life continues, it is to them we owe it."

Dr. Horlbeck then gave a history of the organization of the association in 1872, which has grown until there are now 1,844 names enrolled in its membership. During its existence some of the most important discoveries in the domain of medicine and surgery have been made, and the science of bacteriology has had its birth and development. Nearly every one of the score or more of the bacteria that are pathogenic, and that seriously menace human life, have been found and described in the twenty-five years of the existence of the American Public Health Association.

Since the last annual meeting in Buffalo the method of diagnosing typhoid fever, as discovered and described by Widal, of Paris, has been elucidated by Dr. Wyatt Johnson, of Montreal. He has shown that when a drop of blood from a typhoid fever patient is brought in contact with a typhoid fever bouillon culture of the bacillus *typhi abdominalis* there is an agglutination of these bacilli and a cessation of their mobile characterization. This method is now being utilized in a number of cities, and arrangements have been made whereby physicians can send a drop of blood, moist or dry, in a suspected case of typhoid to a bacteriologist, who will in a few hours determine the disease.

During the twenty-five years of the life of the association, the processes of taking care of contagious diseases have entirely changed. It is now an essential feature of the practice in all communities to confine all such cases to the individual affected.

NECESSITY FOR A PURE WATER SUPPLY.

The water supply of all communities is one of the most important matters, and sanitarians will surely be called upon to care for it. Whether the source of supply be shallow or deep wells, cistern or river or lake water, each involves special problems in arranging to free them from polluting causes. Now even the smallest cities are not content without an abundant supply of water for drinking and lavatory purposes and the removal of sewage.

Parkes estimates twelve gallons daily as about the quantity of water required by a man for cooking, potation, ablution and house-washing purposes. London finds thirty-five gallons per capita none too much, and some cities in our country, notably Philadelphia, are furnished with over 200 gallons per capita daily. An abundant, increasing, inexhaustible supply of water carries in its train incalculable possibilities, not only for individual cleanliness, but for the development of industries, which will employ tens of thousands of people who may thus obtain means of occupation for existence, and with good maintenance increase their powers of resistance to disease.

It would seem almost needless to call to the notice of the members of this association the great issues involved in a pure water supply, free from disease producing germs. Diseases which are appalling in their death rate are transmitted principally by water. The most common mode of conveyance of cholera and typhoid fever is by water, and many other diseases are believed to be so transmitted. Greater purity is demanded every year. When the supply is taken from lakes every source of pollution is removed; when taken from a river the problem is more intricate and vexatious, as it involves the prohibition of cities situated farther up from using the river as a dumping place for sewage. Where rivers must be relied on, filtration, mechanical or artificial, must be resorted to, and a daily microscopical and chemical examination of the water should be made to ensure that the water is free from dangerous bacteria or poisonous compounds.

CHANGES IN QUARANTINE METHODS.

The speaker referred to the great change that had been made in the United States in the last twenty-five years in quarantine methods, especially in the shortening of the time of detention, and the methods of disinfection. Detention has been shortened from twenty-five days to fifteen and ten, and in Southern ports, for yellow fever, to five days. This has been largely due to the energy and sagacity of a member of the association, Dr. Joseph Holt, the distinguished ex-president of the Louisinan state board of health, in his efforts to protect the port of New Orleans from yellow fever. Many methods have been in use for disinfecting vessels at the New Orleans quarantine station for the past twenty-five years, among which are filling the holds of the vessel with sulphurous acid gas; raising the temperature to 350° F.; placing textile fabrics in a solution of mercuric chloride. In 1886 a heating chamber was devised to be used in conjunction with mercuric chloride and sulphur fumes, the latter being driven into the holds of vessels by a revolving fan. Many improvements have since been made, and a plant is now in use by which the temperature in the holds of vessels is raised to 230° F., and the personal effects of passengers are disinfected with quickness and certainty and with little injury.

RECOMMENDS A GOVERNMENT COMMISSION ON YELLOW FEVER.

It is estimated that over 95 per cent of all the yellow fever that has reached our shores has come from Havana. A committee of this association has been appointed to bring this vital question before the governments of this country and urge the governments of the countries interested to prompt action in this matter. This would seem to be the occasion when not only the recommendations of our committee on yellow fever should be carried out, but that this body should make a demand on our general government that a commission of expert bacteriologists should be sent to Havana and Rio and be kept there until the *materies morbi* have been discovered, until the secrets of this marvelous disease have been unfolded. The examples of other countries in the

solution of the problems involved in cholera, tuberculosis, bubonic plague, and leprosy, may be noted; why should we not solve the problems of yellow fever? A systematic effort continuously made will be crowned with success. I recommend that a committee from this body be appointed to wait upon the president of the United States to carry out this idea.

The speaker then referred to the progress being made in conquering the great white plague, consumption, in the discovery by Koch of the bacillus tuberculosis. He said there is in every land a profound recognition of the responsibilities of the governing classes, and that a preventable disease should be prevented. He referred to the declaration of the New York board of health, declaring tuberculosis to be an infectious and communicable disease, and providing for detailed reports of all cases of the disease attended by physicians practicing in that city. He commended the action of the board to every sanitarian charged with the protection of the public against the spread of preventable diseases.

Reference was then made to the experiments made by the state board of health of Massachusetts at Lawrence, on the utility of filtration of the water supply with reference to the removal of typhoid germs, the average result being the removal of 98½ per cent. A diminution of 60 per cent in typhoid cases at Lawrence had been the result of filtration. In Memphis, after two destructive epidemics of yellow fever in 1878 and 1879, the introduction of sewers had greatly improved the general health of the city.

In conclusion, he said that in looking over what had been accomplished during the twenty-five years of existence of the American Public Health Association, we have reason for exultation and pride. We bequeath this noble heritage to our successors in this holy work. We transmit to them the light that was handed down to us from our predecessors, and we bespeak in return for this great cause the same loyalty and untiring devotion that we have given to it.

Steamship and Steamboat Sanitation.

The first paper presented was a report of the committee on steamship and steamboat sanitation, by Dr. Frederick Montizambert, general superintendent of quarantine of the Dominion of Canada. Dr. Montizambert said in part :

In connection with the relatively shorter voyage of the steamboat, a few points present themselves which it would seem well specially to emphasize. Passengers' bedding—those portions of it which are not regularly laundered, blankets, mattresses and pillows—should be freely exposed to the air and, if possible, to the sunshine after each trip.

The somewhat common usage on inland steamboats of having the dining room on a deck below the water line is not to be commended. Such a position renders proper cleanliness and ventilation more difficult and tends to unwholesomeness.

The holds of steamboats are more likely than those of steamships to become the recipients of the frequent storage of perishable articles of food and freight. They therefore urgently need to be frequently emptied, cleansed, and freshly whitewashed.

Your committee cannot allow the opportunity to pass without again referring to the all-important matter of the exposure of the traveling public, on steamboats as elsewhere, to the danger of contracting disease from fellow travellers suffering with consumption, who, in their expectorations, scatter infectious material broadcast. Objectionable and indefensible as it is at all times, with steamboat saloons closed and artificially heated, the expectorator's filthy habit becomes especially dangerous to other passengers. The sputa drying on the decks rises as dust to be inhaled, and to add to the great list of the victims of this fell destroyer of mankind. All spittoons that it may be necessary to provide should contain water or a disinfecting solution, which should be frequently changed.

And it would be well that all states, provinces, and citizens should add to their sanitary codes a prohibition against spitting on the floors and decks of ferry and other steamboats, and

should require all steamboat companies prominently to post in their boats printed notices forbidding this spitting, and to enforce the same. It is a matter doubtless difficult to enforce, but any measure of success therein would be a definite improvement upon existing conditions. And with the advancing education of the general public in the knowledge and belief in the contagiousness of consumption, and the methods to be employed to limit and prevent its spread—to which education such printed notices may be made to contribute—an ever-increasing degree of success may be confidently hoped for.

House Drainage and Ventilation.

The report of the committee on sanitation, with special reference to drainage, plumbing, and ventilation of public and private buildings, by Mr. G. W. Hughes, of Montreal, P. Q., advanced a doctrine at variance with the commonly accepted teaching and practice. This was nothing less than the proposal to abolish all traps, both at the sewer connection and at all minor connections within the house. Reliance would be placed entirely on ventilation by means of the usual main ventilator,—an extension upwards of the main soil pipe,—and to such subsidiary pipes as the details of arrangement in a given case would require, all to be of ample size and carried so high above the roof that nothing would hinder or prevent certainty of action. Every trap is necessarily a depository of filth; traps may, and sometimes do, become partly clogged, hence the usual arrangement of handholes and branches for cleaning; the deposits in them are sources of noxious exhalations, scarcely less offensive and injurious than those directly from the sewer; the best practice, moreover, demands now a special ventilating pipe from the house side of the trap; finally, ordinary traps become unsealed and useless by evaporation after a short period of disuse. The writer also condemned all devices for allowing sewer-air to escape directly into streets, as is usual through the manholes. He would provide for the escape of sewer-gas by the afore-

said house ventilators and by special ventilating pipes carried to the highest available points along the route.

[These suggestions are not new to sanitary engineers. The present accepted practice is recognized as a choice of evils. Undoubtedly any trap, if neglected,—not flushed out frequently,—may become a source of offense, the common condition of sink-traps as used in the ordinary dwelling, without proper care. If the air in the sewers were always warmer than that outside, as in winter, the proposed system of natural ventilation might be fairly effective; but during periods of rapid change of temperature outside and in "heavy," damp weather, the conditions might be quite unfavorable. Again, since house connections must enter the sewer below the horizontal diameter, special provision must be made in any case for the escape of gases in the upper part. After years of discussion, and costly experiments with forced ventilation, the accepted practice of today is to shut out the sewer-air from houses by traps, so far as possible, and have the ventilation of the house drainage entirely independent. The sewers must have a free outlet, if possible, or ample vent at the outlet, and plenty of openings along the line for free entrance or exit of air; while all sewage must be carried away so speedily, by good grades and abundance of water, that there shall not be time for advanced putrefaction.]

Dr. John L. Leal, health officer of Paterson, N. J., followed with a paper on the "Drainage, Plumbing, and Ventilation of Public and Private Buildings."

He said in part:

"The importance of the subject cannot be overestimated. One of the results of civilization is that a very large proportion of mankind passes a very large proportion of its time shut up within four walls. Thus situated, mankind is far removed from a state of nature, and must suffer certain consequences due to these acquired conditions. With the advance of civilization these conditions become more and more unlike the primeval condition, and, therefore, more and more harmful."

In dealing with the question of ventilation, Dr. Leal emphasized these three points: First, that every building intended for occupancy should have some special means of ventilation; second, that these means should be commensurate with the requirements of any particular building; third,

that the more simple and uncomplicated the means used the more successful is likely to be their operation.

"The object of plumbing," Dr. Leal continued, "is, first, immediate withdrawal from a building of certain waste products of life, the presence of which would prove detrimental to health; and second, to prevent harm to the inmates of the said building arising from these products after removal, through the means of their removal. Not only are we threatened by the presence of these substances, but we are also threatened by certain dangers inherent in the best systems at our disposal for ridding ourselves of them."

The remainder of the paper was devoted to describing properly constructed appliances. The subject aroused considerable interest, and was discussed by several members.

Dr. E. A. Abbott, of Philadelphia, was fully in accord with the contents of the paper in the main, but objected to the interpretations of the conditions to the effect that modern teaching on ventilation, as formulated from exact examinations, does not justify the belief that there is present in improperly ventilated houses substances capable of inducing specific diseases, but that the evil results of bad ventilation are principally seen in the personal discomfort to which they give rise.

With regard to plumbing, Dr. Abbott said that unless the plumbing is so defective as to permit of the leakage into the house of actual infective matters contained in the examination, it is impossible by any of the approved scientific methods to demonstrate in the air of otherwise badly plumbed houses matters that can be certainly said to stand in causal relation to disease. The result of experiments on the relation between the gaseous products of decomposition and health have failed to demonstrate that the former stands in any definite causal relation to the latter. Statistics show further, Dr. Abbott said, that the health of workers in sewers, upon drainage fields, and those employed in and about glue factories is, in general, as good as that of the community at large. With regard to the section of the report on drainage Dr. Abbott was in full accord with the views of the writer, and

cited in his discussion of the paper the conspicuous instances in which improvements of a locality had resulted in improvements in the health of that locality.

Car Sanitation.

The report of the committee on car sanitation, by Prof. S. H. Woodbridge, of the Institute of Technology, Boston, Mass., was then read by deputy; also a paper on the same subject by Dr. Granville P. Conn., president of the state board of health of New Hampshire.

The first report said, in summarizing the question, that something like interstate agitation and regulation are requisite to any legislative advancement in this field of hygienic improvement. For this reason it seems the better way that the movement should originate within, or, at least, be fostered by some strong railway corporation which shall set the pace for other railroads to put themselves in step with eventually.

The second report considered the subject quite comprehensively as to means and methods, and the obligations of railway companies towards the public. Rules to be observed by the trainmen to secure intelligent oversight and management of the ventilation and the suitable appliances provided to secure it were suggested.

General discusion was elicited by this topic. Dr. Hurty, secretary of the Indiana state board of health, gave an interesting account of the work already accomplished in this direction by a large railway corporation, the so-called "Big Four," which has perfected a system for thoroughly cleaning and disinfecting its cars. Cushions are perfectly freed from dust by an air blast working at a pressure of 100 to 125 pounds per square inch. In the cleaning use is made of a 1 per cent solution of formaldehyde; the woodwork is carefully washed and then rubbed with sterilized cloths. This cleaning is usually done after each one hundred mile trip. Besides this a general fumigation of each car is made monthly with formaldehyde gas. Moreover, on each train, a can of formaldehyde solution is kept ready for use in emergencies. Similar meas-

ures are taken, or soon to be used, on the so-called "Clover Leaf," Wabash, and Vandalia lines. The Pennsylvania Company is studying and discussing the question, and is expected to adopt an efficient system of disinfection in the near future.

Professor Fletcher, of the New Hampshire board of health, called attention to the fact that successful ventilation of cars depends upon conditions not amenable to regulations. At sixty miles per hour, a train moves eighty-eight feet per second; at forty-five miles per hour, sixty-six feet per second, and so on. The violent displacement of air in front and the strong suction at the sides and beneath produce drafts and whirlwinds which surround the cars, excepting one or two in front, and raise an enveloping cloud of dust; even coarse sand and fine gravel are stirred and thrown about in the rush. Moreover, unless a good breeze is blowing across the track, the smoke, cinders, and gases from the locomotive generally find the readiest draft and passage along the top and sides of the train. Hence, with all our boasted improvements and luxuries in railway travel, the modern passenger often finds himself, especially if in the rear cars of a train, in an exterior atmosphere akin to that of a great chimney. The more efficient the ventilators, the more speedily the dust, smoke, and coal gases pervade the interior of the cars. No netting or strainers have proved equal to arresting all the dust, while the gases, however diluted, must enter. Until the roadbeds are made dustless, and motors are used which operate without furnaces, the problem of ventilation cannot have a complete solution.

Lack of Proper Humidity of Indoor Atmosphere.

A valauble and suggestive paper on this topic was presented by Dr. Henry G. Barnes, of Boston, Mass. The author cited figures showing the observed relative humidity in some of the most arid regions of the earth, as in New Mexico, Arizona, Southern California, desert of Sahara, Arabia, etc. His own observations had proved that in houses and office rooms in Boston and vicinity, heated by steam or hot-air furnaces, the

relative humidity is often less than that found in some of the arid regions, *e. g.*, 20 to 25 as against 24 to 35, etc. Results: drying up of and damage to furniture, books, etc.; air uncomfortable and injurious to breathe; thickening of the mucous membrane of the air passages; causation or aggravation of bronchial coughs, and predisposition to attacks of influenza or other infection. The ordinary evaporating pan in a furnace and urn on a stove are utterly inadequate, even if faithfully used, which is seldom the case. In the Bell Telephone building, in Boston, the heated air, before passing up to the rooms, absorbs moisture from a fine spray in a suitable chamber, thus acquiring a healthful amount of moisture. The effect is noteworthy, in comparison with usual conditions, for the air at all times is balmy and refreshing, like that of a June day. Dr. Barnes has devised a simple arrangement for obtaining proper saturation of air, applicable either to the basement coil-box, when indirect radiation is used, or to the ordinary hot-air register. A metal pan, a foot or more long, six inches or more wide, and about six inches deep, is surmounted by a stout wire frame (copper or brass wire, preferably), from which hang successive folds of cotton felting, exposing about ten square feet of total surface for an ordinary living room of 3,000 cubic feet, or less. In a room this is placed inside of a wooden box, of ornamental cabinet wood if desired, having a slatted opening on one entire side for free exit of the warm air. This will have an open bottom if placed over a floor register, or an open side if in front of a wall register. When the pan is kept filled with water the folds of felting, reaching to the bottom, will absorb water as fast as it is evaporated by the passage of the warm air between and around them. A proper relative humidity is from 50 to 55 degrees. All the conditions of health and comfort are greatly improved by breathing air thus treated. An excess of evaporation is indicated by moisture or frost work appearing on a cool window pane; then the proportion should be diminished.

[The present writer, many years ago, finding that evaporation from urns or pans about stoves or furnaces should be measured by many quarts instead of a few pints for an ordinary dwelling,

per day, provided a good-sized pan for the top of a stove and an outside pan on top of a furnace, besides the usual water pan on the inside of the door opening into the hot air chamber. But in many situations Dr. Barnes's plan of exposing a large surface of saturated cloth will secure more uniform results with very little care. The importance of this principle, especially in its application to schoolrooms and hospital wards, cannot be overestimated, and every citizen in our northern climate, responsible for the heating of houses or institutions, should be well informed on the subject, *and act accordingly*. The degree of humidity and its regulation may be attended to in a very simple way. Provide two ordinary thermometers. Around the bulb of one wrap a little wicking, which allow to extend down into a small bottle kept filled with water on a little shelf just below the thermometer, which thus becomes a hygrometer. Hang the other thermometer also near by. The evaporation from the wet wick will cause the reading of the hygrometer to be lower, according to the dryness of the air and the more or less rapid rate of action. Note the *difference* of readings of the two instruments. Then look in the following table for the number on the horizontal line given by the temperature of the room and also in the column headed by the difference just noted.

INDICATIONS OF THE HYGROMETER (DRY AND WET BULB).

Temperature of the air, Fahrenheit.	Difference of Temperature or Degrees of Cold, Wet-bulb Thermometer.																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Degrees of Humidity, Saturation being 100.																								
32°	87	75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	92	85	78	72	66	60	54	49	44	40	36	33	30	27	...	...	...	...	...	...	...	...	...	...	...
52	93	86	80	74	69	64	59	54	50	46	42	39	36	33	30	27	25	...	...	...	...	...	...	...	...
62	94	88	82	77	72	67	62	58	54	50	47	44	41	38	35	32	30	28	26	21	...	...	...	...	...
72	94	89	84	79	74	69	65	51	57	54	51	48	45	42	39	36	34	32	30	28	26	24	23	22	...
82	95	90	85	80	76	72	68	64	60	57	54	51	48	45	42	40	38	35	33	31	29	27	26	25	...
92	95	90	85	81	77	73	70	66	62	59	56	53	50	47	45	43	41	38	36	34	32	30	28	26	...

For convenience a copy of this table may be posted up near the instruments.

In a recent experience of the writer, the proper humidity was regained in a medium-sized building by placing a galvanized iron

pan, 3 feet long, 2 feet wide, and 4 inches deep, on top of the uncased steam heater in the basement, the door from which was frequently opened or left open; filled with water the evaporation in this case was two inches per day, more or less.]

Yellow Fever.

The interesting papers and discussions on yellow fever had little practical value for people of a northern state.

A paper entitled "A Contribution to the Study of Yellow Fever from a Medico-Geographical Point of View," prepared by Dr. Eduardo Licéaga, president of the supreme board of health of Mexico, and Dr. José Ramirez, secretary of that board, said, in part:

"In the port of Vera Cruz, which, as has already been shown by one of us, Dr. Licéaga, can be considered one of the sources in which the yellow fever germ obtains a spontaneous growth, only three cases have appeared during the period under study, and these three cases all came within the month of June. With respect to other points on the Gulf coast, and especially the ports, we can safely assert that during the period covered by this report not a single case of yellow fever has presented itself."

After referring to certain other slight epidemics, the paper continued:

"We once more show the difficulties that are encountered up to the present in establishing an exact diagnosis between yellow fever and certain forms of paludic infection that in hot countries assume a very similar aspect and the serious character that is generally borne by that disease, so much so that even persons who are accustomed to observe the two affections are often uncertain as to the diagnosis. These doubts will in future be dissipated, if, as is to be hoped, the discoveries of Dr. J. Sanarelli are confirmed, who appears to have discovered the yellow fever microbe in the city of Montevideo. A knowledge of the cause of the disease will not only allow us to establish an exact diagnosis, but will also doubtless facilitate the means for attacking it in a certain manner.

"The epidemic of yellow fever that is now prevalent in

some parts of the coast of the United States will give the physicians of these localities an opportunity to study under exceptional cases the efficiency of isolation and disinfection.

"The same epidemic has now presented a phenomenon that is unique up to this date, that our port of Vera Cruz, which three months ago had not suffered from yellow fever, should now be taking serious precautions to avoid contagion from the United States, as at this moment happens, when the steamer Uto is anchored in that port, having arrived from Mobile with three patients, who have been ordered to be held isolated and under observation in the lazaretto of Sacrificio."

Dr. William Bailey, of Louisville, in discussing the paper, said that on August 14 a man came to Louisville from Ocean Springs, where the epidemic is thought to have started, displaying marked symptoms of yellow fever. He subsequently died in a private sanitarium after having shown every symptom of yellow fever. Notice was sent to the authorities at New Orleans, and the latter were advised to investigate the disease at Ocean Springs. This was done, but, in the face of the positive diagnosis of the man who had died at Louisville, the disease at Ocean Springs was decided not to be yellow fever. A week later new cases developed in Ocean Springs, and the epidemic was recognized.

Brig.-Gen. George M. Sternberg, surgeon-general, United States army, referring to the time when Philadelphia was a plague-stricken city, said he supposed that at that time it was a city without paved streets or without sewers. Now, if fifty yellow fever patients were brought to Philadelphia he doubted if an epidemic could be started. He thought he could say the same of New York.

Speaking of the advent of yellow fever in New York several years ago, he said that, although thirteen cases had been introduced there, no new cases had occurred.

"I believe," said the surgeon-general, "that that city which is thoroughly paved and sewered is yellow fever proof. That is our ideal of prevention in the future."

Surgeon-General Sternberg also gave an interesting talk

on the bacillus of yellow fever, with which, in common with Sanarelli, his name is so prominently identified.

Typhoid Fever.

The papers and discussions on this subject elicited little of great importance that has not been already well presented in the New Hampshire state reports of the board of health. A very recent result, however, is the emphatic indorsement of the Widal blood reaction in the diagnosis of typhoid fever, as proved by careful tests conducted in the laboratory of the Philadelphia board of health.

Formaldehyde as a Disinfectant.

On this topic the following valuable papers were presented and gave rise to an interesting discussion:

"Report of the Committee on Disinfectants," by Prof. Franklin C. Robinson, professor of chemistry in Bowdoin College, Maine.

"Fumigation Experiments with Formaldehyde," by Professor Severance Burrage, S. B., department of sanitary science, Purdue University, Lafayette, Indiana.

"Determination of the Amount of Formaldehyde Yielded by the Formaldehyde Lamp," by E. A. de Schweinitz, chief of the bio-chemic division of the United States department of agriculture, Washington, D. C.

"Some Experiments with Formaldehyde Gas," by Dr. James F. McShane, health officer of Baltimore, and Dr. William Royal Stokes, bacteriologist of the Baltimore board of health.

Professor Robinson, the inventor of one form of lamp for generating the gas, found that the results under usual conditions are by no means satisfactory. As a general principle, the amount of gas liberated must have a close connection with the time,—an effective time,—of action. Under the best conditions he did not find that the gas would penetrate pillows, cushions, etc.

Professor Severance had tried four kinds of generators, and finds that the claims of the makers of any of the forms of generating apparatus are not yet all realized. Under certain con-

ditions the dry gas will kill all germs, but under ordinary conditions of production and operation hitherto realized the gas has not killed all pathogenic germs. Only the typhoid germ was killed after an exposure of four to six hours. Dr. de Schweinitz found some of the paraform tablets yielded only 50 per cent of the amount claimed for them; that one solution guaranteed to give 10 per cent actually gave 1½; another gave 5 to 6 per cent instead of 50; while a few preparations did yield as much as 10 to 15 per cent, instead of the 40 claimed. The Baltimore experiments showed no good results in less than eight hours under the best conditions. Discussion elicited the fact that the authorities of Chicago and St. Louis have reverted to the use of sulphur and are entirely satisfied, in connection with insistence on exposure to sunlight, fresh air and soap and water.

In the Barber Shop.

A paper by A. W. Suiter, A. M., M. D., of Herkimer, New York, on the "Barber Shop as a Menace to the Public Health." Dr. Suiter is chairman of the committee on legislation of the Medical Society of the State of New York.

"It seems that the time has arrived," said Dr. Suiter, "when the attention of this association and, through it, that of public health authorities in general, should be called to that part of personal hygiene which applies to the barber shop. It is astonishing that while the sanitary relations of most if not all other public occupations have been investigated to the minutest detail, and salutary restrictions in many instances of the most vigorous character have been imposed to protect the public interest, the first attempt to regulate the operations of the barber shops and to apply to them the rules of sanitary administration has been made within the month just passed. That this common mode of infection should have for so long escaped authoritative attention in these days of asepsis and antisepsis may be noted as one of the most contradictory circumstances of our time." After giving an interesting historical review of the barber, Dr. Suiter continued:

"The first attempt of modern times to regulate sanitarily

the operations of the barber shop was recently made in the city of Paris. As a police regulation, and by direction of the sanitary authorities, an order has been promulgated requiring that specific rules of asepsis and disinfection shall be observed in all shops, for the protection of the public. These directions include the use of only metal combs, in order that they can be easily sterilized, and that, as far as possible, all instruments shall be of metal; that they,—razors, clippers, scissors, combs, etc.,—shall be subjected to a heat of 100 degrees centigrade before and after use; that the shaving brushes must be washed before and after use in boiling water, and the hands of the barbers thoroughly cleansed before passing from one customer to another. They are required to use sterilized towels and pulverizers in place of the common powder puffs, and the hair that is removed is to be disinfected and promptly taken from the room. Chemical solutions are also prescribed for obvious purposes.

"The writer is not informed as to the method by which it will be made certain that these regulations will be faithfully observed, but doubtless a system of inspection will be inaugurated under police surveillance, which will insure detection in case of non-observance and the proper punishment of all offenders.

"As individuals we are constantly reminded of the grave personal dangers which threaten the patrons of the average barber shop, and many of us have long since adopted measures of prevention for self-protection. One evening several years ago, a sheepish-looking individual shuffled his way into my office waiting-room and requested a prescription. He was observed to be suffering from disease, and presented a most unattractive appearance. His face was literally covered with eruptions, and his mouth and lips were ulcerous in high degree with the form of manifestation known as 'mucous patches.' His hair was fast falling, and in short he was a perfect focus of infection. His case was disposed of, and he was gladly dismissed. Having to take an early train, I shortly afterward proceeded to the barber shop to prepare for my toilet. My barber's chair was occupied and I sat down to await

my call. As the occupant was about to arise I was startled to observe the very patient for whom I had prescribed one hour previous. It is needless to state that I took my departure. Then and there I resolved that my face should never again be shaved by a barber. I also adopted a plan for my occasional visits to the barber shop for the trimming of hair and beard, carrying always a packet containing shears, combs, and clippers, and insisting that everything be removed from the chair and clean towels substituted, and that the barber thoroughly wash his hands before proceeding. And for all this I tender him so large a fee (beforehand if he is a stranger) that he cannot complain of what ordinarily seems to him a hardship. The only inconvenience I experience is that among the tonsorial fraternity of my vicinity I am compelled to bear the somewhat unsavory title of the 'Champion Crank of the town.'

"This item of personal observation is introduced only to direct attention to one phase of the many dangerous situations which will readily occur to the sanitary mind, and it seems entirely unnecessary in this presence to attempt to elaborate this simple note of warning and protest by offering illustrative examples. Instances almost without number might be collected and presented to prove the transmission of various diseases by the methods commonly practiced in tonsorial operations. Pages might be written from the scientific standpoint to show the prevalent violation of well-established hygienic principles and the possibilities of parasitic bacteriologic communication. Such an effort should be a work of supererogation, indeed. The assumption is quite warrantable that there is scarcely a step in the processes usually employed by the barber which does not carry an element of danger when the most careful precautions are not observed. In fact, it may well be doubted whether even with such precautions as might be, and sometimes are, made use of in the ordinary way, such articles as combs, brushes, and sponges would still be unclean and capable of conveying vitalized elementary substances from one person to another.

"Take the matter of sponges, for example. No surgeon thinks of using one a second time, unless it is passed through

a process of disinfection, requiring an amount of time and labor which more than covers the cost of a new one; and yet in many, if not most, barber shops the same sponge is repeatedly used from face to face with nothing more than a simple squeezing between each sitter, which cannot remove the infective blood or pus from the often broken or eruptive cuticle.

"In the opinion of the writer is is absolutely impossible—no matter how good may be the intention—properly to cleanse and sterilize any of the instruments employed without consuming an amount of time and material which would render such an effort impracticable. Hence, it appears that nothing short of such compulsory regulations as have been adopted by the Paris authorities would be effective. Local administration of this character should be made to apply to every barber shop, whether rural or urban, and a system of inspection established to enforce the rules. There will be found in many localities some items which the Paris regulations do not seem to cover, such as the particularly dangerous use from patron to patron of the alum stick to stanch the flow of blood from the cut cuticle, the common use of the block of magnesia to complete the drying of the newly shaven man—both of which articles sometimes do continuous service for weeks and months for the occupants of the same chair. Of course, these remarks do not apply to all shops, as many of them are kept as cleanly as possible without scientific disinfection, and most of the better class of barbers would gladly join in the movement for reform if a proper opportunity is offered. It is remarkable that since this information has come to us from abroad the medical journals and newspapers are teeming with commendatory comment, and wonder is often expressed why this subject has been for so long unnoticed.

"Without doubt the people will be quickly educated to the necessity for action, and the efforts of health boards will be supplemented and facilitated by favorable public sentiment."

Animal Diseases and Animal Food.

D. E. Salmon, D. V. M., chief of the Bureau of Animal Industry, Washington, D. C., reported for the committee on animal diseases and animal food.

"During the past year," the report said, "there have been no outbreaks of disease among the animals of America of unusual extent or manifesting peculiar characteristics. No exotic diseases have been introduced among our live stock within this period, nor have any new problems arisen, so far as your committee is informed, in connection with the protection of the public health from diseases affecting our domesticated animals.

"Nevertheless, there are numerous questions which have confronted practical sanitarians for years, some of which have been discussed at the previous meetings of this association, and which are still debated, misunderstood, and more or less neglected by health authorities. Instead of losing interest as time goes on, some of these questions are becoming more important and more urgent. Your committee can only refer to a few subjects which the events of the year have made particularly prominent." The report discussed anthrax, tuberculosis, and public abattoirs. Speaking of tuberculosis, the paper said: "The problems connected with the control and eradication of this disease among dairy cattle are becoming better understood, and the general plan of procedure outlined by your committee at the Chicago meeting is being largely adopted. That is, the dairymen are being encouraged and influenced in various ways to dispose of their diseased animals and replace them with healthy ones. The boards of health of many cities are requiring more rigid inspection of dairies and compliance with prescribed sanitary regulations by those who produce milk for consumption within the territory under their jurisdiction. In a number of states there are state boards which are especially charged with the duty of controlling tuberculosis. In some, if not all of the New England states, regulations are in force requiring that all dairy cows brought into these states shall have been tested with tuberculin and found free from the disease. Similar regulations are soon to be enforced by the authorities of the state of Pennsylvania."

Meat Inspection.

A paper read by Leonard Pearson, B. S. V., M. D., of the Veterinary Department of the University of Pennsylvania, treated of methods of meat inspection. He said in part :

In this country the existing systems of meat inspection may be divided into two classes, national and local. For some years the United States bureau of animal industry has conducted a constantly improving meat inspection service that now extends to animals killed for export and for interstate trade in the principal meat packing centers of the country.

The work is performed by veterinarians, who examine all carcasses, stamp those that are sound and condemn those that are unfit for food. There is also a microscopical examination of pork for the detection of trichinæ, but this extends only to the products prepared for export. Some of the cities in the United States have also organized more or less complete meat inspection systems. The system in New Orleans, originated and developed principally by Dr. A. S. Wheeler, is perhaps as perfect as exists anywhere in the United States. It provides that all animals killed locally for food shall be inspected and the meat stamped. Moreover, all dressed meat brought into the city must be stamped in a similar way. And it is unlawful for any butcher to sell meat that does not bear the stamp of the meat inspector. In Montgomery all meat-producing animals are killed in a central slaughter-house under the supervision of a meat inspector. These systems and all that are followed in European countries place the responsibility of deciding whether a given carcass is suitable for food upon an inspector who is trained in animal pathology.

In some other cities, as Philadelphia, the meat inspection system is based upon an entirely different principle. There are laws prohibiting the sale of diseased or unwholesome meat, and it is assumed that the butcher is always competent to determine this point. Under this system detectives or police officers are appointed to visit slaughter-houses, markets, and butcher shops, hunt for diseased or unwholesome meat, which is condemned by a veterinary adviser called in by them,

and the seller is often prosecuted. It is scarcely necessary to say that this system is undesirable: 1, because it does not include an inspection of all meat sold and inevitably permits the consumption of much that is injurious, and, 2, because it assumes knowledge on the part of the butcher that he cannot possibly possess, and makes him responsible for conditions that he cannot recognize. The system is therefore incomplete, and as a permanent system it is unjust. Its chief advantage lies in the fact that it tends to make butchers more careful, so that gross pathological conditions do not reach their stalls and a portion of the diseased meat that would otherwise be placed upon the market is barred. However, such a system constitutes a beginning in the right direction, but no municipality should be satisfied with it if a better can be obtained.

Municipal meat inspection is of more importance in the East than in the West, because tuberculosis is more prevalent in this region and a great many worn out dairy cows are sent to the shambles. Many of these cattle are afflicted with tuberculosis and other chronic ailments. They are frequently emaciated and constitute the most dangerous class of beef animals. Philadelphia is situated in the midst of a bountiful dairy district, and is a large consumer of these animals. They are not killed in a large central abattoir, under constant supervision, but in numerous little slaughter-houses scattered throughout the city and its suburbs. There are about 100 slaughter-houses in Philadelphia. Many of these are quite small, situated on back streets, surrounded by stables and dwelling houses. In these establishments cattle are frequently killed at night or very early in the morning and are not inspected at all. Occasionally, and as often as possible, the inspector drops in while the carcasses are being dressed, and his vigilance is rewarded almost daily by the discovery of a diseased and dangerous animal. The business of these slaughter-houses is conducted so irregularly that it is not possible to properly control them without having almost as many meat inspectors as slaughter-houses, and if the force were enlarged to these dimensions the sanitary conditions and

the surroundings of the slaughter-houses would still be such as to seriously injure the wholesomeness and keeping qualities of much of the meat dressed in them.

A further reason for a better system of meat inspection here is that there is a constant and growing demand for many parts of carcasses which are more frequently diseased than the flesh, and were formerly thrown away. Our ever increasing foreign population consumes viscera, for which there was no market a few years ago, and meat inspectors frequently find that such organs are diseased to an extent that renders them unwholesome, while the rest of the carcass can safely be sold. As a result of the fact that inspectors are not constantly present, a great many diseased carcasses are unquestionably sold, and frequently without the knowledge of the butcher who handles them. His training is not sufficient to enable him to detect symptoms and lesions. In some cases, however, he does detect them and remove them so thoroughly that the suspicions of the meat inspector are not aroused.

The conditions that prevail in Philadelphia are not unique. They exist in almost every city in this country, and it is largely on account of the multiplicity of slaughter-houses that thorough systems of meat inspection have not been more generally established. An adequate control of the meat supply of Philadelphia cannot be enforced without a great extension of the present force or a concentration of the business of slaughtering. The latter plan is supported by the experience of all the older civilized countries, and is to be recommended, not only because it would facilitate the inspection of meat, but for several other reasons as well. It would do away with all of the small, poorly equipped, badly managed slaughter-houses, which are in many cases nuisances in their respective neighborhoods. It would make it unnecessary to drive cattle through the streets, a practice that blocks traffic, frightens people, and at times occasions serious accidents. It would give small butchers the advantages enjoyed by wholesalers; they could use the facilities of the large slaughter-house which are immeasurably superior to their individual establishments,

and the cold storage system could be used by all with economy to the dealer and advantage and increased wholesomeness of the meat to the consumer. The offal and the condemned organs and carcasses could be disposed of to better advantage. Local meat would gain in reputation if such a system were enforced, and trade could be built up on its merits, and competition with western beef would be less difficult.

Effect of Poor Window Glass on the Eyes.

Dr. Cressy L. Wilbur, registrar of Vital Statistics of the state of Michigan, read the report of the committee on nomenclature of diseases, after which Dr. Edward Jackson, of the Philadelphia Polyclinic, read a paper on "Eye Strain from Poor Window Glass."

Dr. Jackson spoke of the eye strain caused by astigmatism, and manifested through headache and other nervous symptoms, and called attention to the fact that the same effects might be produced in perfect eyes by defects in glass placed before the eye, as window glass. Inequalities of thickness, he said, make such glass act like a lens, and irregularities of refraction may produce the same effect. The bad influence of defective window glass is intensified by the eye having to look through different parts, causing different kinds of strain, so that the eye could not adjust itself so as to work with the best advantage. Even if the defects in the glass are comparatively slight they will, at a certain distance, cause serious strain, similar to that of astigmatism.

Only plate glass, Dr. Jackson said, is free from such defects, and, if very thick, it may also be defective from irregularities in the composition of the glass. The strain from defective window glass is one of the particular causes of car sickness, he claimed, and even though plate glass cannot be used in all windows, it might be adopted in all public conveyances. While some luxuries are harmful, good window glass is one that is altogether beneficial in its effects.

Individual Drinking Cups.

A resolution presented by Dr. Howard H. Anders, and referred to the executive committee, was as follows :

"Whereas, The common and promiscuous public use of drinking vessels, under existing conditions and well-established hygienic principles, is positively and essentially unclean and insanitary, and therefore a menace to the public health; and

"Whereas, During the past three years many churches of various denominations have recognized the need of prophylaxis in administering the communion wine by adopting individual communion cups or chalices, as being cleaner and safer, at the same time not less satisfactory and sacred, as substitutes for the communion cups; be it hereby

"Resolved, That the American Public Health Association, in endorsing the individual communion cup reform, approves cordially the action of the churches, and recommends earnestly the adoption, for sanitary reasons, of individual communion cups wherever communion cups are now in use; and further, be it

"Resolved, That this association recommends still more emphatically and urgently to the public the general use of individual cups, particularly in schools, on railway trains, in stations, at public fountains and the like, as contributory to the better preservation of the public health and the prevention of communicable diseases."

Tuberculosis.

The third day's session was given largely to the consideration of tuberculosis, the program containing no less than five papers dealing with different phases of that subject.

Dr. Peter H. Bryce, secretary of the provincial board of health of Ontario, read a paper in which he emphasized the view that in dealing with tuberculosis it is the duty of the state to do whatever cannot be done so well by the individual.

He was followed by Dr. Samuel W. Abbott, secretary of the state board of health of Massachusetts, whose subject was "Consumption—An Indoor Disease." Dr. Abbott said that no form of infection had been studied with greater interest during the past quarter of a century than that of tuberculosis.

The prominent characteristics of the disease, which he described, might, he said, be considered as accounting mainly for the fact that consumption bore the characteristics of an indoor infection.

"Two persons standing or working at a distance from each other of five or ten feet," he said, "are far more liable to transmit and to receive infection from each other when indoors than in the outdoor air.

"In consequence of the peculiar methods under which tuberculosis is spread from one person to another, from the sick to the well, it is therefore desirable that the most careful attention should be bestowed upon the condition of those persons who are compelled either to live or to work indoors, and that a due measure of the work of boards of health with reference to the restriction of the spread of this disease should be expended in this direction. The danger from the consumption of milk and meat of tuberculous animals has been investigated, and thus far, while the danger to be feared from this cause may be said to have passed from the region of possibility to that of probability, that which may be feared from the diffusion of sputum in inclosed areas or spaces may be said to amount to a certainty."

As proofs that consumption is an indoor disease, Dr. Abbott said he would call attention, first, to the evidence shown by occupations, and secondly, to the evidence presented by the conditions of age and sex. In concluding Dr. Abbott said it must be admitted that tuberculosis is an infectious disease.

"Its character," he said, "is too well defined, both by observation and by experiment, to admit a reasonable doubt. The active principle of infection, the bacillus of tuberculosis, is recognizable; it is capable of isolation from the body, of cultivation and of inoculation into the lower animals. But, practically, the exact mode of infection, when applied to the daily intercourse of human beings, is extremely limited, and no evidence has ever been presented which tends to show that such infection ever occurs by exposure in the open air,

either by the breath of consumptives or by the distribution of sputum upon the surface of the soil. On the other hand, abundant evidence shows that such infection is of very common occurrence from indoor exposure to the distribution of sputum deposited upon floors and dried under favorable circumstances.

"By this I do not mean to infer that the outdoor free distribution of the sputum of consumptives should be encouraged or allowed, but should be prevented on the general principle that filth of all kinds is a nuisance to the sense of sight and of smell, but not because any real danger from such outdoor distribution has actually been shown to exist."

At the close of the morning session the members visited the Medico-Chirurgical College and Hospital, where they were entertained at a luncheon, and were afforded an opportunity of inspecting the splendid new amphitheatre and the various appointments of the institution.

Urgent Need of Sanatoria.

The afternoon session opened with the reading of a paper by Dr. S. A. Knopf, of New York, on the urgent need of sanatoria for the consumptive poor of large cities.

The question what to do with the thousands of tuberculous patients who inhabit the tenement districts of our large cities, unconsciously disseminating the germs of their diseases among their own kin, friends, and neighbors, or who crowd the wards of our general hospitals to the detriment and danger of the patients suffering from acute diseases, has become, for the sanitarian, one of the vital issues of the day.

In Europe such men as Von Leyden, of Berlin; Von Schroetter, of Vienna; Graucher and Letulle, of Paris; Weber, of London, and in this country Biggs and Pruden, of New York; Bowditch and Otis, of Boston; Flick, Hinsdale, and Lee, of Philadelphia; Hamilton, of Chicago, and others believe the only solution to be the erection of special sanatoriums, preferably under municipal control.

In Europe the pleadings of the profession for establishments

of this kind have not been in vain. Germany alone can boast of over thirty sanatoriums for the consumptive poor already in working order or in the course of construction, most of them under municipal control. In the United States there are only two or three partly supported by private charity, and not one institution which we may justly call a municipal sanatorium for the consumptive poor. Only recently we of New York and you of Pennsylvania have had the painful experience to see the chief officers of our respective states veto appropriations intended to create institutions which might have become the nucleus of more efficient work than has yet been accomplished in the United States in the extermination of this dread disease. Far be it from me to criticise the action of these distinguished governors, who thought to serve their state best by vetoing an appropriation which seemed to them unnecessary.

To convince them of their error, to convince the many of our fellow practitioners who also deny as yet the need of special institutions for the consumptive poor, to show to the philanthropist a most practical and noble way to do good, not only to the consumptive individual, but indirectly to the whole community, I will ask them all to accompany me for a moment on a little excursion to a crowded tenement district of one of our large cities.

Let them visit there with me some of the consumptive poor who live in these houses, in all the various stages of the disease, from the incipient case of pulmonary tuberculosis to the last hectic stage of consumption, with all its pitiful manifestations of the slow ebbing away of human life.

Let us leave our comfortable homes and enter the narrow streets of those districts, crowded with humanity. We make our way into a house through the little world in rags playing on the sidewalks. We inquire after the patient, and find him lying on a bed or couch in a dark bedroom. We examine him and find him suffering from pulmonary tuberculosis in the last stages. On examining the other members of the family we find one or two of them already "touched" by the deadly

germ. In an audience of sanitarians there is no need to explain how the other members of the family have been infected."

Dr. Knopf explained how one tuberculous individual is capable of transmitting his disease to whole families. The majority of hospitals supported by private charity, he said, refuse admission to consumptives. The speaker described the pitiable condition and insufficient care of the consumptive patient in a general municipal hospital.

The value of isolation may best be shown by the work of St. Joseph's hospital for consumptives, of New York, where the majority of patients admitted are in the last stage of the disease. Dr. Cauldwell, the physician-in-chief, very kindly gave me the following information : This institution receives annually 1,500 consumptives, at an average daily expense of about fifty cents per patient. Dr. Cauldwell does not claim to be able to do more than care for them under existing circumstances, although a goodly number are discharged able to work again. But leaving aside the curative results, St. Joseph's hospital, by taking care of 1,500 patients coming from among the poorest classes, suppresses annually 1,500 foci of infection. How many lives may not thus be saved indirectly ?

Of course at Liberty, Saranac Lake, and Sharon, in view of the fact that these institutions are only intended for incipient cases, the curative results are much more favorable. Thus Dr. Trudeau could report from 30 to 35 per cent of cures with an average stay of eleven months ten days. This shows very great importance of early diagnosis. At the Liberty sanatorium, of the patients who remained over three months in the institution 50 per cent were improved, and about 25 per cent cured. With those who stayed a shorter period the results were less favorable.

But aside from the considerable number of cures which can be effected in a sanatorium for consumptives, especially when the hygienic and dietetic treatment, under constant medical supervision, is strictly adhered to, there are other sanitary advantages of inestimable value which a community could

derive from the creation of one or several sanatoriums for the consumptive poor. In a perfectly conducted sanatorium, where the curable cases are cured and the hopeless cases cared for, so that it is impossible for them to propagate the disease, all patients receive a hygienic education, so as to understand why they should only expectorate in a proper receptacle, what they should do or not do to avoid new colds, why it would be unwise for them to marry as long as they are not perfectly cured, etc., etc. When the patient who has passed through such a sanatorium returns to his home cured or only improved, he will become an educational factor in public hygiene. He will not only have learned to avoid the causes which may aggravate his condition, but he will still use his pocket spittoon and tell his friends that he uses it to protect them from any possibility of getting the disease through him, and, at the same time, he will know that through such precaution he also protects himself from reinfection.

When the worthy but poor consumptive is taken in time to an institution where his chances for recovery are still good, he will have little chance to infect the other members of the family, and he is likely to return, after a relatively short sojourn, restored to health and hygienically educated, ready to become again a bread-winner and supporter of his family. Now, the maintenance of this patient in a municipal sanatorium for from three to six months, or even longer, during the earlier stage of the disease, will cost the commonwealth no more than if he had been taken to the general hospital for, perhaps, the same period of time, but at a much further advanced and more hopeless state of his disease. If the family were absolutely destitute, the members would have to be supported by the municipality, whether the head of the family were in the sanatorium or general hospital. But since, when treated in time and in a special instituion, he has 25 or 35 per cent more chance of getting well, the likelihood of the community being obliged to support a widow and several orphans has thus also been reduced by nearly one third.

Dr. Knopf described what he called an ideal plan of how to

proceed to select the proper cases for treatment in such institution, how to avoid unnecessary expenditure on the part of the city government, and, lastly, how to avoid admitting to free treatment patients able to pay. In closing, Dr. Knopf said :

"Our prophylactic measures, no matter how strict, will not suffice to do away with the centers of infection, daily created anew in our tenement districts. To prevent the hopeless cases from communicating the disease to the large number of susceptible individuals with whom they will come in contact, to give the tuberculous patient yet in the early stages of the disease, but with little or no means, the best possible chance of becoming a well man and a useful citizen, we need municipal sanatoriums. Let physicians, statesmen, and philanthropists unite to further the creation of such institutions, for through them I think we will not only alleviate much suffering, but will solve one of the most important and difficult problems in medical and social science."

The two other papers on the program were : "Bovine Tuberculosis in Its Relation to the Public Health," by Dr. D. H. Bergey, first assistant in the laboratory of hygiene, University of Pennsylvania, and "Tuberculosis and Milk Supply," by Dr. Mazyck P. Ravenel, Bacteriologist to the state live stock sanitary board.

Dr. Ravenel quoted from many authorities, showing that tuberculosis, as seen in children, starts in a great majority of cases in the intestines. He held it would be reasonable to suppose that the disease came from the children's food, namely, milk. He quoted other authorities, citing cases in which milk was the source of infection, and still others, in which the tubercle bacillus had been found microscopically in milk. Again, he showed that the disease had been produced by feeding milk to lower animals, and that the disease in the lower animals and in man were one and the same. Dr. Ravenel told of experiments which he had made on 154 guinea pigs. Omitting those animals which had died too soon to show symptoms of the disease and those used to control other experiments, he said, 15.4 per cent developed tuberculosis from one

single dose of milk derived from cows known to be tuberculous. It was not necessary that the udders of cows should be diseased, he said, for them to give tuberculous milk, and the only way to avoid drinking tuberculous milk was to examine the herds. The latter was an absolutely certain test for detection of even incipient cases. He urged the importance of the slaughter of all animals known to be tuberculous, or at least their removal from the herd. Special care should be taken to avoid using milk for infants from even suspected cows. If necessary to use suspected milk it should be pasteurized or boiled.

An interesting discussion followed the reading of the papers. Dr. Lawrence F. Flick, of Philadelphia, said in part :

This very important subject cannot be too much discussed. We all agree that the disease is preventable, and that the two most prolific sources of contracting it are through the sputum, and from domestic cattle.

He did not accept the idea that infection was so much conveyed through milk, Dr. Flick said. Out of an extensive experience he had not seen the first well-established case. He called attention to the close clinical relation between persons in the same family. Cases where children contracted tuberculosis usually occurred, he said, in the same house where their parents having the disease resided, and, therefore, only by the establishment of special hospitals could the diseased persons be removed from the family center. Wherever cases had been taken from the family circle there had been a reduction in tuberculosis. No hope of accomplishing great results could be looked for until the public was educated on the subject of the infectiousness of the disease. This education was going on, however, Dr. Flick said, and in Philadelphia in the last ten years there had been a reduction of the disease by one third.

"In Pennsylvania," he said, "we are trying to educate the people to get a hospital, and in twenty-five years we will succeed in practically stamping out the disease here."

Dr. Lydia Rabinowitsch, of the Woman's Medical College,

who is not a member of the association, was accorded the privilege of taking part in the discussion. She told of experiments which she had made in the past two years with butter and milk. Of the samples of milk examined, she found from 20 to 30 per cent to contain tubercle bacilli. In eighteen samples of butter from different stores she had not found one bacillus of tuberculosis, but had found a micro-organism which resembled very much the bacillus of tuberculosis.

The Question of Water.

Water was the subject of the papers which followed. F. H. Newell, hydrographer of the United States Geological Survey, Washington, D. C., on "Investigations of Water Supply by the United States Geological Survey," told of the thorough examination of the geologic structure, mineral resources, and products of the United States in which the geological survey is engaged. In closing he said:

"It has been demonstrated again and again that purification of sewage by filtration or by irrigation is practicable and can be conducted at reasonable expenditure, and it is to be hoped that the time is rapidly approaching when public sentiment will be aroused to the degree of compelling such filtration whenever public health and comfort are imperiled. Toward awakening such public sentiment the division of hydrography of the geological survey, is trying to do its part by presenting definite facts clearly and impartially, and showing what are the character and limitations of the natural water supplies, and how these may be utilized and protected."

"A Brief Review of the Work of the Sand-Filters at Lawrence, Mass.," by H. W. Clark, chemist in charge of the Lawrence experiment station. The last named said, in part:

"Lawrence is a New England manufacturing city, situated upon the Merrimack river, and with a population at the present time of about 50,000. Up to 1875 the water of the city, used for all domestic purposes, was obtained from ordinary wells. In that year, however, a public water supply system was constructed, and the water pumped to the reservoir and distributed to the citizens was taken from the river at a point about one mile above the city.

"Nine miles up the river from the intake of the new system was the city of Lowell, at that time having a population about the same as Lawrence today, but now containing about 85,000 people. The sewage of Lowell was then, and is now, discharged into the river, and above Lowell are other cities and towns also discharging their sewage into the river and its tributaries.

"This water supplied to the people of Lawrence by this system was, then, from the beginning, badly polluted, but was evidently purer than the average well water previously used, as shown by a considerable decrease in the death rate of the city following its introduction.

"Gradually, however, typhoid fever became more and more prevalent, and finally the death rate in the city from this disease became the highest in the state, being about three times as great per 10,000 inhabitants as the average city in the state."

Mr. Clark said that the cause of the epidemics of typhoid fever, which visited the city during months of the year when other cities of the state were comparatively free from this disease, was the polluted water supply, and the question of a new supply began to be agitated. In the meantime, investigations in regard to the purification of Merrimack river water by sand filtration had been carried on at the Lawrence experiment station of the state board of health, and had resulted so satisfactorily that as early as 1891 the city was advised to construct a sand filter large enough to filter its entire water supply, and in 1892 the city government made an appropriation for beginning its construction under the state board of health.

"In the January following the starting of the filter the number of cases of typhoid fever was nine, or one eighth as many as during the previous January. This fact is more striking when we note that in Lowell during this month there were ninety-nine cases, or three times as many as during the previous January. In January, 1895, there were ten cases in Lawrence; in January, 1896, six cases, and in January, 1897, two cases.

"A more satisfactory demonstration of the effect of the filter upon the health of the people of Lawrence can be made, however, by stating that in 1887 the deaths from typhoid fever were 12.00 per 10,000; in 1889, 13.75; in 1890, 13.33; in 1891, 12.20; and in 1892,11.11. During 1893 the filter was built, and hence during a portion of the year filtered water was being used. In 1894, however, filtered water was in use during the entire year, and the death rate from typhoid fever was 5.00 per 10,000; during 1895 it was 3.07; during 1896, 1.86, and the rate for the present year promises to be exactly the same as for 1896.

"Besides giving a water free from disease germs, the filter is also giving a cleaner water, one more attractive and palatable, and containing but 50 per cent of the organic matter of the river water."

Today's sessions will be held at the University of Pennsylvania, where the members of the association will be entertained at a luncheon.

A National Department of Health.

The report of the committee on health legislation contained a proposed bill to establish a department of public health, the latter to be under the control and management of a commisioner of public health, who shall be a regularly educated physician, appointed by the president of the United States, and whose term of office shall be six years.

That part of the final report of the executive committee which recommended favorable action by the association on the proposition elicited considerable discussion before it was adopted.

The resolution which prevailed was as follows:

"*Resolved*, That this association reaffirms its urgent opinion, and petitions the congress of the United States to organize and establish a national department of health.

"*Resolved*, That this association transmit to congress a copy of the report of the committee on health legislation, with the accompanying papers."

Transportation of the Dead.

The report of the committee on the transportation and disposition of the dead was read by Dr. Probst, secretary of the state board of health of Ohio. Among other things this report favored the preparation of bodies for shipment by a licensed embalmer. Dr. Henry, of Asbury Park, objected to this on the ground that it sought to create a special class of workers, to whom all the business would be restricted. He offered a motion, which was carried, that the report be adopted, but that the words "by licensed embalmer" be stricken out, and "under supervision of the provincial or state sanitary authorities," be substituted.

Women's Health Protective Associations

And their relation to the public health was ably presented by Mrs. John H. Scribner, president of the Woman's Health Protective Association of Philadelphia. The great interest in this address was due not alone to the personality of the speaker, but also to the organization for which she spoke. In only four years of existence this association of earnest, well-informed and public spirited women has become a great force for the betterment of many conditions and interests of their fair city.

The object of the association is to promote the health of the city by study of sanitary and hygienic conditions, and by active co-operation with the municipal authorities.

A committee on contagious diseases is moving vigorously for the establishment of a hospital for people having contagious diseases, who have means to pay their expenses, where they can remain until they recover without menace to the lives and health of their families and the community.

A committee on street cleaning has moved the officials to more effective action for the proper removal and disposal of ashes and garbage; has procured the better drainage and paving of certain streets and alleys, and has been actively at work in various ways to lessen the habit of spitting in public buildings, market houses, and on the sidewalks.

The committee on water supply, at the request of the citizens' committee, visited the experimental filters erected by three different companies in Louisville, and were convinced that grave dangers to health would result from the use of alum as a coagulant, in the quantities necessary for cleansing the water of Philadelphia. They therefore called in Mr. Allen Hazen as an expert, who spent several weeks in examining the water-works of the city and developed a plan for sand filtration. This report was presented to the mayor for the use of the city, and has been widely quoted.

The trolley committee devoted itself to efforts to secure better protection to the motormen from the weather, the abatement of expectoration in the street cars, and the better heating and ventilation of the cars.

The schoolhouse committee visited and thoroughly inspected 163 buildings during one winter. They also called to their assistance Professor Woodbridge of the Massachusetts Institute of Technology, a recognized expert on the sanitary condition of public buildings, who inspected thirty-two representative buildings of various types. In many cases they found conditions most unhealthy and dangerous, with consequent sickness among the pupils, and by reports and agitation strove to arouse the parents and authorities to a sense of the need of immediate action to secure decent accommodations for the children. Special attention was called to eighteen buildings or rooms (mostly rented) positively injurious and utterly unsuited for school purposes.

The down town branch secured recreation piers on the river for the use of the poor, waged war upon the piggeries, agitated for a free public bath house, for free drinking places, and for wash rooms in the schools, and organized a Children's Clean City League.

The bakeshop committee met the executive board of Journeyman Bakers and discussed plans for the improvement of the condition of the journeymen, for an investigation of bakeshops, and to urge one day of rest for employees. "The reports rendered were almost incredible, and proved the neces-

sity for a thorough revolution and renovation in bakeshop history."

"Twenty-two shops were visited, with interesting results. A few of them were clean, and in consideration of the pressing inconveniences upon the occupants of those places, they were to be highly commended. Our investigations were made by night, during the working hours, mostly in the slum districts; we found most of them unclean, and the only light, gaslight, which fast consumed the pure oxygen. We descended into disease-breeding atmospheres, breathing foul odors from closets, drains, and gutters, and saw the bread prepared that would next morning be on the tables of many fastidious but thoughtless customers."

The daily press took up the question, conferences and public meetings were held, and a bill was presented to the legislature in February, 1897, to "Regulate the Manufacture of Flour and Meal Food Products and Providing for Sanitary and Clean Bakeshops."

A playground committee agitated for the more effective use of the parks by better permissive regulations for the children.

Finally, a literature committee and an entertainment committee attended judiciously to their appropriate work.

The fourth annual report shows a membership of nearly 400 women, and endeavor will be made to have it 1,000 or more. Money received during the last year, $5,548; expenses, $3,284.

Similar organizations are doing effective work in several of the leading cities of the United States, and there is ample opportunity as well as urgent need for active interest and labor by the women in both large and small communities all over the land. Many of the evils to be remedied affect directly and intimately the children and the home. Women of intelligence, with time to spare, have here a field of noble activity, in doing away with ignorance and prejudice, educating the people in sanitation, and stirring up the proper authorities *to give attention* to all conditions affecting the public health and *to take timely action.*

Disposal of Garbage and Refuse.

From the standpoint of the sanitary engineer, one of the most important papers presented was the report of the committee on disposal of garbage and refuse, prepared by the chairman, Rudolph Hering, civil engineer, of New York. The report contains a vast amount of information regarding both American and European practice in garbage disposal. Only the conclusions were read by Mr. Hering, and even this is so long and of such a character that a brief abstract cannot readily be made.* The writer said in part:

The present and final report is to a certain extent supplementary to the previous reports, but it contains all the conclusions which have heretofore been stated. The Appendix contains the replies to circulars from over 150 American and Canadian cities, which constitutes a valuable mass of information concerning the status of the question in this country. It also contains description of the most important methods of disposal in detail, and of receptacles, carts, wagons, etc., which appear to have given fair satisfaction. It finally contains descriptions of the best European practice and the results thereof.

After defining garbage and stating the difficulties of this very complex sanitary problem, the report treated, in order, of collection and removal, character and composition, and then at length of final disposal, *(a)* by individuals, *(b)* by communities. Under the last head the author treated "separate removal" in all aspects. We quote one paragraph:

"The fact that domestic garbage contains a fair percentage of grease, and that the remaining material may be converted into a fertilizer, has caused the development of processes in this country for converting garbage into these two materials to be sold at a profit. The works which must be erected for this treatment of garbage can only be profitable if large quantities are handled. Such works have been erected in a num-

* For the summary of the full report see "Engineering News" for Nov. 4, and "Engineering Record" for Nov. 6, 1897; both published in New York City. A full illustrated description of the disposal works at Hamburg, Germany, may be found in "Engineering Record" for Oct. 23, 1897.

ber of cities in the United States. Companies were formed and the work was undertaken with the expectation of conducting a very profitable business. Experience has demonstrated, however, that in many instances there was no profit and that in others it was small. It has heretofore been impracticable to conduct the works so that a nuisance would be wholly prevented, and it was, therefore, found best to locate them at points where an occasional nuisance would not be objectionable. After several years of operation a number of these works have been abandoned because, under the necessary sanitary restrictions, they were not found to be remunerative." . . . .

"Your committee feels compelled to state, with reference to the disposal of these materials, that a separation does not seem to be economical or advisable, unless the conversion of garbage into salable products is an assured profitable business. It has not been so found in the larger cities of Europe, and separation is not there practiced.

"*(b)* Combined Removal.—When no separation is made of the various waste materials, and all are collected together, there is, in the opinion of your committee, but one way in which the final disposal should be accomplished; namely, by cremation. This is the system successfully adopted under these circumstances in many cities of Europe, and it is growing in favor every year. (See statistics in Appendix.) In England the burning of city garbage and refuse has been practiced in some cities for half a century. Considerable experience has, therefore, been gained regarding the most suitable construction of the furnaces and the manipulation of the material.

"Within the last two years, extensive experiments have been made in the cities of Hamburg and Berlin on the subject of garbage and refuse cremation, as already stated. The results there obtained with garbage that contains less combustible matter than the English, and still less than the American garbage and refuse, indicates without any doubt that a destruction of this material by fire can be an economical process,

besides offering a thoroughly sanitary solution of the garbage question."

In discussing Mr. Hering's reports Mrs. Scribner thought that not enough stress had been laid upon the value of the reduction process of garbage disposal. She said that when cremation alone was practiced in Philadelphia, the collection by the garbage contractors was not satisfactory, but with reduction the collection had been better, because salable products resulted from this process. She also thought that garbage disposal plants should be in the hands of the city, so that if any profit results the city may have it.

Mr. Crosby Gray, president of the board of health of Pittsburg, stated that some two years ago a garbage reduction system was put in operation in that city. (See Engineering News, October 3, 1895.) During the first year the plant proved to be very objectionable, but improvements have been made so that during the past year, or less, the offensive odors from the process and the product had been greatly reduced. He thought they would soon be entirely obliterated.

Dr. Ernest Wende, health commissioner of Buffalo, stated that the Arnold system of garbage reduction had been in use there for five years, and is now giving satisfaction.

In closing the discussion, Mr. Hering stated that the committee does not wish to condemn reduction. It has no objection to the process where it is not a nuisance and the cost is not prohibitory. He also called attention to the fact that reduction disposes of only a part of the refuse of a city. The cost of handling the balance should be added to the cost of reduction when comparing this with cremation.

THE PUBLIC HEALTH.—PUBLIC RIGHTS V. PERSONAL LIBERTY IN HEALTH AFFAIRS.*

By Prof. Robert Fletcher, Ph. D., Civ. Eng., dean of the Thayer School of Civil Engineering of Dartmouth College and member of the State Board of Health.

Boards of health are unpopular. As a part of the executive power of the government they are included in the department of police, and we are aware that the guardians of law and order do not enjoy the entire confidence and good will of all sorts of people.

Local boards of health find that some of their most conscientious and praiseworthy efforts for the public welfare are met by prejudice, opposition,—even to open resistance in extreme cases,— and not seldom by unjust personal resentment against the individual member.

Happily, such a situation is not universal, for there are in this state not a few progressive communities where sanitary science is understood in good degree, and where intelligent majorities have secured proper sanitary conditions, or are making a good beginning.

Even the state board of health, whose functions are of such a general advisory and educational nature that there is much less direct contact with individual interests, is too little valued. The people's representatives in the legislature have sometimes betrayed the popular misjudgment,—assuming an attitude, on more than one occasion, apparently of mere good-natured toleration, perhaps hardly appreciating at its true value the past and present work of the board. If there were a better acquaintance with the fourteen published volumes of the reports of the state board, even the most unappreciative individual must admit that the state pays a small price for what it receives. The cost would be moderate even for the

* Read before the N. H. Association of Boards of Health.

more strictly clerical work in the collection and arrangement of vital statistics, and in the performance of other duties imposed by law, which are only indirectly related to sanitation. Moreover, the wide range of valuable information, closely related to the life and health of the people in many ways, which these reports also contain, should command the attention and consideration of all well-informed citizens.

The popular feeling we are noticing may be characterized as one of impatience; at what too many,—even among our own friends and neighbors,—look upon as meddlesome interference with private rights. Better informed people perceive that much of this feeling springs from ignorance, usually partial, but sometimes complete, of what is now well-established sanitary science. If this constituency, which contends for personal liberty in such matters, could send us a representative to express their sentiments, he might compress some of their most extreme, as well as some of the more moderate views, into the following monologue:

"My house is my castle. My premises are not to be invaded without warrant. Anybody who noses about my buildings is a trespasser. If my ways don't suit other people they have no occasion to meddle. What if my well is surrounded by my barnyard, and pigsties, and privy? The water is clear and suits me. My father and grandfather drank it and lived to be old men. As for the kitchen slops, a short spout from the sink into the garden just behind is quite sufficient. The dooryard is sometimes a little more handy, and my mother and her mother before her found such arrangements good enough. Ditching and laying drain-pipe cost money and take time.

"Do I clean out my barnyard more than once or twice a year? What is a barnyard for if not to collect solid and liquid manure? Mine is as good as the average. I clean it out when the manure is wanted. I can't afford to drain and compost the liquid and keep things dry all the time. Such fussing may do for a gentleman farmer who can hire more help than I can.

"Who says my cow-stable is unhealthy? Who talks about

no ventilation and one end being as dark as a pocket? There are two or three small windows at the south end. There were windows on the other sides but the glass got broken, and it was cheaper to board up than to set new glass. Besides, the modern idea is that cows must be kept warm, and boards are warmer than glass. Our grandfathers are blamed for having too much ventilation, because they left open wide cracks between the boards, which let in wind and snow on to the cattle. We think enough fresh air comes in by the doorway, and, if we keep the barn fairly warm, ventilation must take care of itself.

"You object to cartloads of dung piled behind the stall, and the mire a foot deep? Do you suppose we can carry out the stuff every day? I calculate to clean out about once a month in the winter time. Of course a shut-up cow-stable gets to be a leetle strong, but we get used to it. Cows always have stood it and they always will.

"Are the udders ever cleaned before milking? Not so very often of course. Would you treat a cow like a baby? You have to take cows as they are naturally. Our hands can't be kept lily white either,—but they are cleaner than the cows. Of course a little dirt gets into the milk,—a few specks, but we usually strain it. A little cow dung don't hurt a body.

"What is the effect of all this on the milk, and what do the customers think of it? Well, they are too particular. These health fellers are putting notions into their head. They talk about milk absorbing stable odors, and getting infected with microbes, and so on. They want dairymen to have cemented floors, and whitewash the stables, and give the cows a bath every day, and wear white aprons when they milk, and, maybe, sterilize the milk. We have heard of such dairies, run by cranks most likely, but how is a poor farmer going to make any money in the milk business if he has to put on all that style?

"And now comes all this talk about sputa. Do they expect to keep people from spitting? What is a man going to do if he has the grip or consumption, and a raising cough? The barn floor isn't any too good for me to spit on, and I guess the store floor, or the street car, or sidewalk aren't any better.

"What is going to happen when mill-owners have to fight for the rights and privileges which they have always had heretofore? Why should anybody try to stop the turning of sawdust, and shavings, and chemicals, and wool-washings, and so forth into a stream or pond? Or the keeping of a privy over the water if that is convenient? The law gives a right to natural drainage. Why should an owner go to great expense to get rid of waste because people down stream think the water is being contaminated? Let such a community do the filtering and the cremating themselves; they can afford to better than an individual. They used to tell us that a running stream purifies itself; let the folks below take their chances.

"If any of my family are down with measles, or scarlet fever, or diphtheria, why should my house be placarded as though we had the black plague? That adds insult to injury. We know enough to take care of our sick, with the doctor's advice, and to warn off the neighbors, when that's necessary, which it isn't always, for even doctors sometimes give a false alarm. I tell you it is too much meddling. And then, after all, to be ordered to burn up the children's books and playthings, and re-paper and re-paint the sick room, and to fumigate and turn the house inside out, it's more than a man of small means and some independence can stand.

"Then, again, this craze about tuberculin tests is turning some folks' heads, and they want to kill off the cattle if they think they find a few microbes somewhere about them. They want to inspect all the hogs for fear of trichinæ. They find fault with the stock business of the railroads because the cattle have to stand up in the cars and don't get much to eat or drink, and get to market more than half dead after traveling a thousand miles, more or less. They think that a butcher who has to pick up his cattle anywhere in the country, and buy them good, bad, or indifferent, ought to feed the public with fatted calves and make the price very low at that. Other parties are trying to take away from the people the freedom of certain ponds for bathing, boating, and fishing. Of course

they will have to stop the skating, too, unless they can get skaters to sign a pledge not to expectorate. Why, if these sanitary folks and the Society for the Prevention of Cruelty to Animals could make the laws to suit them the little liberty left to us would be too highly respectable for the average man."

While no one man is likely to hold all of the above sentiments, yet from the talk and actions of many whom we meet, we are left in no doubt about these and other grievances which our liberty-loving friends have against the "sanitary cranks." We can sympathize with them somewhat from their standpoint. But they need to take another point of view, where they can see a few facts which will set them to thinking in another direction. For "are they not all honorable men" and mostly level-headed? Perhaps they have forgotten that the divine law of Moses included a police regulation which virtually forbade a privy within camp limits. In Deut. xxiii: 12-14, the motive for this is thus stated:

"For the Lord thy God walketh in the midst of the camp to deliver thee, and to give up thine enemies before thee; therefore shall thy camp be holy: that he see no unclean thing in thee and turn away from thee."

That is to say, the cleanliness of the surroundings of the entire body politic, or nation, was a condition of the divine blessing, and personal decency had an immediate relation to the public weal. That was three thousand years ago, and, as a principle, it cannot be less true in the far wider world of today.

It is a pity to rehearse elementary facts, but our unconverted friends must have a fairly full statement in order to know just where they are today.

1. Water Supply.—One (Prof. E. J. Bartlett on "Potable Water," reports of the New Hampshire state board of health, Vol. 13, p. 196) has truly said that "a well is a hole in the ground." Under usual conditions it receives the subsoil water of the surrounding country and the leakings of the soil near by; the latter is generally polluted and commonly quite foul, whether in town or country. Such soil has little proper

filtering power; only clean sand filters with best effect. Experiments at Lawrence proved that even clean garden earth has but small and sluggish action to purify dirty water. Sad experience in hundreds of recorded cases, and thousands unpublished, proves the average well-water to be the cause of debility, low fevers, and other sickness, even when not poisoned by typhoid or other of the more dreaded disease germs. The glamour about the old family well must give place to a sense of danger, and the song of the "Old Oaken Bucket" be esteemed as sentimental rubbish.

Rain-water collected in a cemented cistern may be safer if the cistern is clean and has a proper filter. Among the hills farmers may have, as many do, pure spring water; in the lowlands deep artesian borings usually yield the best of water. Wide awake communities are now alive to the question of supply by public water-works. The last volume issued by the state board of health gives reports on the water-supply of sixty-five towns in this state. The "Manual of American Water-Works" just published by the Engineering News Publishing Company, of New York, shows that there are in New Hampshire seventy-one towns having full or partial supplies, and two projected works. Of these, sixty-two have a full supply for domestic use and fire protection. There are fifty-three separate works, twenty-four owned by the public, twenty-seven by private parties, and two jointly. Some remarks of the editor of this most valuable manual are just to the point here. He says:

"Much has been written of late regarding changes in the standard of living, the growth of urban population, and the rapid increase in municipal expenditures. Of the many phases of the subject, one that has but little consideration from the general student of social problems is the growth of water-works plants in number and efficiency. Considering only the number of works it may be noted that at the beginning of this century there were practically no water-works in the United States or Canada, whereas there are now nearly 3,350 complete works in the two countries, supplying more

than that number of towns, of which about 2,780 have been built so recently as since 1880, and some 1,400 in the past six years.

"Think of the effect upon the standard of living caused by the introduction of a public water-supply! In place of the labor attendant upon lifting water by the old oaken bucket, the more prosaic hand pump, or of carrying in pails from some spring or stream, only a turn of the faucet is now necessary in hundreds of communities, to secure either hot or cold water on one or more floors of a dwelling. The labor saving thus secured, together with the increase in convenience, comfort, and cleanliness, is too evident to need detailed mention, especially as both the old and the new are within the experience of so many. Neither is it necessary more than to refer to the other benefits of public water supplies, such as fire protection, street sprinkling, and water motors for household, business, and light manufacturing purposes. Altogether, the ideas which these few words will suggest, coupled with the large number of villages, towns, and cities supplied with water-works in recent years, are sufficient to impress one with the immense change in the standard of living and customs and habits of a vast portion of our population wrought by this one improvement.

"Perhaps a word should be said regarding the effect of so many public water supplies upon the health of the countries in question. In most cases the introduction of running water by the municipality or some private company means the abandonment of badly polluted surface wells, previously the only available source of supply. Exhaustive studies in Massachusetts and elsewhere have shown conclusively that, with the abandonment of surface wells for pure public water supplies, typhoid fever has decreased to a most marked and gratifying degree. If the general health of a community could be as easily recorded as the typhoid death rate, doubtless it, too, would show notable improvement with every advent of pure to replace impure water."

2. Pestilential Disease.—If our friends will see that their town library is supplied with the publications of the state board of health, and will spend only a little time in reading them, they will learn some startling facts; facts, not theories; facts proved and re-proved, and stamped into the public consciousness of many communities by sad experience of sickness and death.

By way of example consider for a moment the dreaded typhoid fever. Its germ is now well known; it may be seen any day in the laboratory of the bacteriologist only 1-10000 of an inch long and 1-30000 broad; too small for detection by an amateur microscopist, but requires a trained detective and special methods to run it down; but there is no mistake about it; always found in typhoid patients upon examination, and invariably in their dejecta; thousands of deaths have been proved to have been caused by its transmission in drinking water or milk, and traced back to a definite starting point; we cannot weary the well-informed by more than a bare mention of the Lowell and Lawrence epidemics; the St. Johnsbury case, the Windsor case, Chicago in 1892-'93, and others which have served as dreadful examples for our admonition. Careful experiments at Lawrence proved that some, out of a large number of this practically invisible plant, could survive twenty-five days in ice-cold water, during which time it might float over six hundred miles in a stream like the Merrimack river. There may be millions in a tumblerful of perfectly clear water, and they are beyond the reach of chemical analysis.

We might allude in like manner to the bacilli which cause anthrax or malignant carbuncle in animals and men, a germ so persistent that if an animal dead with the infection be simply buried in the ground, other animals eating grass over the grave, even years afterwards, may be smitten; also to the bacillus of tetanus or lockjaw, found in the soil and causing death after getting into the blood through a scratch on the flesh, to the bacillus of diphtheria, to the comma spirillum or bacillus of Asiatic cholera, finally, to the tubercle bacillus, the germ of tuberculosis or consumption, probably the cause of

more lingering illness and death than any other single agency, or perhaps any other two agencies, in the world,—much of which comes every year from thousands of infected cattle, through their meat or milk. Other bacteria which do a very beneficent work in the operations of nature, others which are harmless, and others which are harmful only to lower animals have been studied and described and may be identified by the expert.

This is only a glimpse at a whole body of science which is now available to any inquiring mind. But does not even so brief a rehearsal show a good solid basis for a big body of rights which the public must have, as against the ignorant or careless individual ?

As to purity of water supply. Residents on some watershed area may have sickness, infection may be carried, as has so often happened by drainage from their premises, into some pond or stream whence some community draws their water supply. Shall there be no law to protect the larger interests ? May not infected premises be watched and the owners compelled, so far as practicable, to disinfect and dispose of waste so as not to spread infection ? Vested interests in this state have been able to maintain a right to pollute ponds and streams with sawdust and wastes of the most foul description, regardless of their use for water supply a few miles below. Shall this continue indefinitely ? We think not. Massachusetts has taken effective action in this matter to secure the rights of all parties. The city of Worcester, having now a population of nearly 100,000, has been compelled to purify its sewage so as not to make a nuisance in the Blackstone river. Other towns have been compelled to build works to dispose of sewage near at hand. Sources of water supply are carefully watched and defended by their state board of health. England practically set the example in the regulation of sewage disposal so as to wholly prevent or greatly mitigate the pollution of streams. In New Hampshire, it is true, the immediate vicinity of all sources of water supply is protected by a sufficiently stringent law against depositing any injurious substance near

by; we all know, moreover, how ample are the laws against neighborhood nuisances, which give the boards of health sufficient authority and provide penalties which are usually adequate. In the present neglect of the wider field and of the more far-reaching dangers we may see our duty to stimulate public sentiment until our state shall be behind no other in providing all reasonable safeguards against the pollution of its water supplies. Windsor, Vt., had its reservoir infected with typhoid germs, it is claimed, from a source of vile pollution, four miles away on the hills. A fearful epidemic compelled them to wholly abandon that source for drinking water and put in a pumping system at large additional expense. In view of such possibilities can any water-works officials be neglectful, or local boards of health fail to enforce any of the laws already in force, or anybody deny the reasonableness of a larger legal protection ?

What are the rights of the public in regard to the milk supply ? Let us begin at the cow. A recent writer (see Vol. 14, p. 169, "Reports of N. H. State Board of Health") has pictured the milking process thus:

"Particles of dirt from the hands of the milker, from the teats and udder, and from the sides of the cow fall into the pail. The pail itself may have been washed with impure water, and been imperfectly dried, or the germs may have been floating in the air and settled in the bucket before, during, or after the milking. The stables may have been in a filthy condition and the cows lying in the filth and having it adherent to their udders, drop it into the pail. The hands of the milker are often moistened with the milk to contribute greater ease and facility to the process of milking, and drops of the milk thus used, laden with impurities, if not with filth, get into the milk.

"Then, it often happens in many ways that the milk after it leaves the dairy is infected by the addition of water, and by varying changes of temperature, especially a temperature which greatly favors the rapid multiplication of the bacteria. . . . It has been found in several instances that milk was

infected in the dairy because of sickness in the home of the proprietor or of some of the milkmen."

A vigorous man in the prime of life drank a glass of milk at a railroad station; he was shortly laid low with typhoid fever of a severe type, and in a few days was dead. The disease was soon traced directly to its source at the dairy. Shall such occurrences be possible in all succeeding years?

Unfortunately we cannot secure cleanliness by law; but an aroused public sentiment and a proper attention and watchfulness by consumers would compel dairymen, as a matter of policy, to be, at least, decently clean in the conduct of this business. It is now well proved that tuberculosis or consumption prevails greatly among cattle; few wide-awake farmers are ignorant that it was almost a plague in a neighboring state, not long ago, and that our own state established quarantine against cattle from beyond its borders; that our cattle commissioners have taken wise and effective action, so far as possible, among the herds of the state, and that they find more or less of the disease in widely separated sections. A few extracts from the last report of the commissioners are in order here. They say (State Board of Health Report, Vol. 14, p. 140):

"The theory was long ago exploded that consumption is hereditary, and the theory has become equally well-established that the tendency to overcome or to develop the tuberculosis germ is transmitted in blood lines. This is nothing more or less than a delicate constitution in the one instance and a rugged constitution in the other, and the same principle applies both to the human and the bovine race. The one may fall an easy victim to tuberculosis, upon the most trivial exposure, while the other may feed upon tubercle bacilli and never suffer harm. . . . One of the most potent agents in the destruction of the germ is sunlight, and more of this health-giving agency should be invited into cattle stables. It costs little, and has other healthy effects in addition to its power over the tubercle bacillus. The cattle stables should be arranged on the sunny side and should be well provided with windows. We have noted on various occasions the effect of dark, damp

stables, and have almost invariably found the disease in such places. We have also noticed the absence of the disease under the opposite conditions. We have in mind an instance where a tuberculous animal quite advanced with the disease was kept in a herd with twenty-five cattle for two years after the disease was noticed, and upon applying the tuberculin test to the entire herd, this badly diseased cow was the only one that responded. The reason that none others had contracted the disease was the fact that the sanitary conditions of the stable were first class, and a spot as large as a person's hand could not be found in the entire stable where the sun's rays did not penetrate. Open up the dark, damp, dingy stables and let in heaven's pure sunlight, and there will be less tuberculosis."

If these things are so, and if there is a mitigation of the evil so easy, amounting, perhaps, to a simple remedy in many cases, may not the public protect itself ? Shall consumers be indifferent when cattle are shut up in the darkest corner of a barn, where a lantern is needed at all times to see clearly, where solid and liquid manure is allowed to accumulate for weeks,—yes, during three months in a case known to the writer,—where the air is so rank with damp effluvia that the unaccustomed visitor is nearly overcome, where drainage is neglected and all the conditions are filthy ?

We are told that the consumer has an infallible remedy in the sterilization of the milk, which has been widely practised now for many years. This is true; but sterilized milk causes difficulty with many, if not the majority of, users. Moreover, a great mass of consumers know little or nothing about it, and for all there are times and places in which so much painstaking is very inconvenient, if not impracticable.

There are still too many, all over the country, who are yet contented with the old ways, who do not want to know any better. With such moral suasion can do little; it costs too much to be neat and clean and nice about your premises. Public sentiment may do more, but more than all effective action is needed. There should be competent inspection by those who have full authority. What more proper authority

than the local board of health ? Generally its jurisdiction is not now too extended; the public must learn to value at its true worth a good health board, and expect it to discharge its full measure of responsibility, and insist upon laws which will make it most efficient. The advocates of better sanitation must not rest until such a result is secured, nor until it is possible to have such reasonable and appropriate inspection and watchguard of our water supplies and dairy products as shall secure to all of our people, the more favored and less favored alike, a good degree of protection.

We say a "good degree," for that is all. The utmost care and most expensive measures of a purely official kind cannot secure perfect immunity. We are not extremists. We refuse to be classed with "too particular" or "over-nice" people. We are contending for common decency and everyday prudence. If these things are so, what we have proposed is simply a matter of "horse-sense," as the saying is. In spite of the most rigid inspection quantities of unclean and, at times, dangerous milk will be sold. The timid or fastidious and the sickly ones may still have good reason to sterilize. The markets will not be wholly free from tuberculous beef and trichinæ in pork, and the wise folks will continue to eat all meat "quite well done."

No thoughtful mind can fail to recognize the leading of Divine Providence in the superior knowledge vouchsafed to this generation concerning the causes of disease and the means of combating it, and in the consequent increase in the average length of human life by more than twenty per cent above that of a century or two ago. If we, in our time and place, are true to our trust, we may do something towards changing the conflict from a desperate battle to an occasional skirmish.

The question before us might be presented in some other connections and details, some of which have been alluded to, but this is not an occasion to aim at fullness on so large a subject. We have intended only to make a few suggestions and stir up an interest which shall result in effective action—let us hope.

SANITARY SCIENCE AND CIVIL ENGINEERS.

Since it is the special duty of boards of health to maintain the rights of the public in sanitary relations, it may not be out of place to make a few remarks bearing upon the personnel of such a board, and the estimation in which it should be held. In its membership physicians are necessarily considered to be indispensable and lawyers scarcely less so; usually also the importance of a representative of the engineering profession is also recognized, and the latter by the nature of his work is commonly a man of large affairs who understands business. Perhaps we are not so near the border of a neighboring state as to deter us from quoting the tribute paid to the engineer member of the Massachusetts board of health by one of his colleagues. Prof. Wm. T. Sedgwick, biologist of the board, first setting forth the end proposed, says :

"The aim of the biological work has been to discover the origin, functions, and fate of the various organisms concerned in sewage disposal, to differentiate the functions of the organisms involved, so as to learn the conditions of their usefulness, or, if necessary, of their removal; and to co-operate to the fullest possible extent with the engineers and chemists of the board, in the solution of mixed problems, for the sake of arriving at improved and safer methods of sewage disposal and water supply.

"I desire to acknowledge my sense of personal obligation to the chairman of the committee on water supply and sewerage, Mr. Hiram F. Mills, the member of the state board of health resident in Lawrence, who has not only contributed to the investigations of the board, without remuneration, his well-known engineering attainments, but has also personally devoted the greater part of his time to the co-ordination of the work of the Lawrence experiment station, so that whatever of permanent value has been achieved even in a department like this, perhaps the remotest from his own, is largely due to his suggestive guidance and criticism."

One most important result of the researches and wise oversight thus referred to is the now familiar Lawrence filter-bed,

covering two and one half acres, which has given the city the priceless blessing of a nearly pure and quite safe drinking water, even from a source so polluted as the Merrimack river.

For a most appreciative statement of the proper relation of various interests and callings in the promotion of sanitary progress we beg leave to make one more quotation. Three years ago the editor of *London Engineering*, the most widely circulated paper of its class in the world, wrote as follows :

"The preservation of public health is largely an engineering question. It is the business of the engineer to impound, filter, and distribute water supplies, to provide sewerage systems for carrying away the waste of towns, to treat sewage at outfalls so as to render it fit to be discharged into rivers, and in other less important ways to meet the ills that arise from the aggregation of large numbers of population on a limited area. But before he can do this effectually he must have the assistance of chemists, bacteriologists, and medical men; he has not the skill to analyze samples of water, or to conduct any inquiry into the number of bacteria by which they are pervaded; he cannot discriminate between pathogenic and innocuous microbes; the deadly nature of sewer gas is revealed to him only by the researches of the physician. Fortunately, he has no difficulty in procuring the requisite assistance; this country has long possessed a large number of skilled sanitarians, who devote their lives to the investigation of problems affecting health, and whose labors have put us in the forefront of the world on this question. If it were merely a question of the requisite skill and knowledge on the part of the experts, sanitary science would advance at a very rapid rate. But there is another aspect of the question, that of finance. The funds have to be found by the public, and as the general knowledge is usually very imperfect, there is a disposition to defer important works as unnecessary, and when they are commenced, to cut down the expenditures far below the proper amount. There is no organized agency for showing the public how much they have gained from sanitation, and what further safeguards could be provided for their lives

and health, if they would only find the means. Of course, it is generally known that cholera has been practically abolished in this country, and that typhoid fever has been greatly reduced by the provision of pure water and efficient sewerage. But very few people are aware how much their expectations of life have been increased and how much the community has directly gained by decrease of illness and the preservation of life. As far as we know, there is only one state in the world that takes active steps to keep its citizens well informed as to what they owe to sanitary science, and as to what they may expect to gain from it in the future, if they will only make the necessary outlay. This is the state of Massachusetts, the annual publications of the board of health of which are read not only locally, but in all English-speaking countries. It sets an example that might well be followed elsewhere, and of which it is sure to reap the benefit in the higher intelligence and the better health of the people."

We may excuse an Englishman's usual lack of knowledge of things American. He should have recognized the excellent work done by boards of health in other states of our Union. We believe that our own state board is doing equally effective work for this state, in proportion to the powers granted it, and means at its command.

There is a very important question of public right, affecting the interests not only of ourselves, but of our immediate posterity, and that is :

PUBLIC OWNERSHIP OF PUBLIC WORKS.

We are concerned now only with water-works and the sewerage works which are usually a necessary consequence. Without any aspersions upon the companies which own and satisfactorily operate many excellent systems of water-works in this state, it must be admitted that public sentiment is growing more settled in the belief that the rights of all parties are best secured by public ownership. Of 3,196 complete works in the United States, 1,690 are owned by the municipalities which they supply (Manual of American Water Works,

1897, p. 11); of the fifty largest cities in the United States, nineteen have changed from private to public ownership, and only nine are now dependent upon private companies. Altogether, about 200 cities and villages have changed from public to private. Over one half the changes from private to public ownership and only one tenth of the number from public to private. Over one half the changes from private to public ownership have been made since the close of 1890, and only one third of the reverse changes in the same time. In Massachusetts, thirty companies in twenty-seven different cities and towns have given way to public ownership since the city of Boston built the Cochituate works in 1848, and there remain thirty-eight private, against one hundred and thirteen public, works.

Public works, well built and well managed, are for the entire community, a matter of common interest and proper public pride. In the smaller cities and villages, every taxpayer may feel a sense of ownership, and take satisfaction in the thought that he has some voice in the management.

Reference has been made to the matter of cost of such works, and the reluctance of the public to provide sufficient funds. Cities and large towns, with resources proportionate in good degree to their needs, rarely fail to obtain competent advice from experienced engineers. This is only common prudence. But small communities and even large villages sometimes proceed in a short-sighted and blundering way. Having scanty resources at best, often relying upon local talent as quite sufficient to plan and construct such apparently simple works as a mere pipe line from some spring, pond, or brook, or a plain system of drainage, and acting upon the principle "If there is any profit in it, we want to make it," they use up their small capital, only to obtain at last, works which are either inadequate or defective, if not partial failures. They realize too late, that such questions as a proper source of supply, a possible gravity, as against the ever expensive pumping system, the probable future demand, storage capacity for dry seasons, various desirable uses, if the

supply can be made larger than at first thought of, size of pipe (considering possible demands of fire service and allowance for rust or other deposit), loss of pressure due to flow, friction loss, blow-offs, grades, gates for controlling the line in emergencies, that these and not a few other questions call for special knowledge and experience. A few hundreds of dollars spent for surveys and expert opinion may save many times the expense, either in mistakes avoided, or larger results obtained. In these days, when competent advice is so available, there is no excuse for neglecting it. Communities in New Hampshire would be fortunate if they were compelled by law, as in Massachusetts, to consult the state board of health, and have the merits of all plans passed upon, after full examination of quality and sufficiency of water supply, etc., and surveys made, by biologists and engineers acting for the board. But the lack of public appreciation of the public benefit of such a policy, and the fact that it would call for some increase of the appropriations, render it unlikely that our state board will be able to render such service, to its proper extent, for some time to come.

SUMMING UP CONCLUSIONS.

Summing up, we find that the public rights as to sanitation in this state are already well secured by adequate laws relating to abatement of neighborhood nuisances, infectious diseases, direct pollution of water supply, special examination of suspected water in certain cases (but such examinations in the past have been chiefly chemical only), improvement of swamp lands for the public benefit, quarantine on our borders, and in relation to railroad transportation, and cattle inspection, so far as the means granted will allow.

We have seen that the purity of water supplies, as to danger of infection from beyond the immediate surroundings, and the purity of dairy products, are not yet sufficiently guarded.

We can take satisfaction in the assurance, that the new law for constituting local boards of health, which secures uniformity of appointment, and a three years' tenure of office for each member, is a great gain to the state.

We have proposed that such local boards of health shall have jurisdiction as inspectors, with power of reasonable action in emergencies, in all cases where there is manifest danger to the public from conditions which threaten the purity of any source of water supply or which are liable to infect dairy products. We propose that the law shall prescribe such co-operation between local boards of health and the cattle commission, that the latter may be promptly notified of any dairy premises where cattle disease is known to exist, or kept in such condition that the existence of disease may be fairly presumed, and that action in any case shall not be delayed.

We propose that the state shall take proper action to prevent the systematic discharge of the wastes from mills, factories, and villages into waters which ultimately become sources of supply, even though it be at some more remote point. This, of course, excludes the Connecticut river, which already has been abandoned to serve as a receptacle for sewage and other wastes from the states along its banks. It may not be too late, however, to rescue the Merrimack from sewage pollution by its bordering towns, if any consideration is demanded for the cities of Lowell, Lawrence, and Haverhill, which are now forced to drink its waters.

We also urge the need of better appreciation of the value of bacterial analysis of water or milk against which there is a fair presumption of infection, and that the state board of health have authority and means to employ a skilled bacteriologist to make all necessary examinations in such cases.

We urge that local boards of health be prompt to take such wise action, according to various circumstances, as shall rescue from the thoughtless and careless expectorator the public right to neat sidewalks on our streets and clean floors in our railway cars.

Finally, we urge that local boards of health be allowed such amount of discretion and compensation, without unreasonable restriction, as shall make it possible for them to devote to their duties, time and attention in proportion to their responsibility, and which shall secure to their respective towns, the full measure of service which the public ought to have.

THE SANITATION OF OUR SUMMER RESORTS.*

By G. H. Shedd, M. D., north conway, n. h.

During a portion of each year, the rural population of this state is largely increased by the dwellers of cities and towns of other states, seeking health, comfort, and happiness. They may be found by the sea, on the borders of our beautiful lakes, in the valleys and among the grand old mountains, the charm of whose beauties is not excelled by any in the world.

To supply the needs of this summer population, beautiful cottages and elegant hotels have grown up throughout the state, representing millions of dollars of capital, giving employment to an army of students and young people, and furnishing a home market to isolated farming communities that can never be fully appreciated until lost.

To these must be added the hundreds of private cottages, many of which are models of architectural beauty and rich in all that wealth can give, furnishing permanent summer homes for those who have found, with us, that which satisfies mind and body, and the numberless farmhouses, everywhere, whose open doors are eagerly sought by those who desire quiet and seclusion or have not the means to summer at a fashionable resort.

Thus the "summer boarder" has become a large and increasing factor in the growth and prosperity of our commonwealth; second, as I believe, to no other industry within its borders. For, not alone is his value to the community in which he resides to be measured by the dollars he leaves with it, but note must also be made of the value of the character and ability of the individual himself; who, not infrequently, makes our interests his own, and by his wise counsel and broader culture stimulates moral and intellectual growth among the people with whom he sojourns. These are the friends whose coming is eagerly looked for, and whose going casts a shadow brightened only by the thought of their return.

* Read before the N. H. Association of Boards of Health.

If it is true, as I believe it is, that the summer tourist in so large a degree adds to the wealth and prosperity of the state, then it is wise that we see to it that his environment is such as to invite rather than to compel him to seek his health and happiness elsewhere. So, by a somewhat circuitous route, I come to the subject of this paper, "The Sanitation of Our Mountain Resorts." It is not expected that a physician, necessarily, is a sanitary expert, and I shall attempt to treat this subject from a physician's point of view, only. I therefore ask your indulgence if I but rethrash old husks, and leave the kernel uncovered. Pure water and pure air are the two first and most important considerations in the sanitation of summer resorts; and, with pure soil, form a complete formula for good sanitation. As the time at my disposal does not allow a consideration of the subject as applied to resorts in all parts of the state, I have confined myself to mountain resorts, and practically to the east side, comprising the towns of Conway, Jackson, and Bartlett. This circuit includes forty-five hotels and boarding-houses, receiving water supply as follows: Twenty-two are supplied by the North Conway Water & Improvement Company, which takes its water from Artists Falls brook east of the village of North Conway, and Mountain brook in Upper Kearsarge. Both these brooks are mountain streams, fed by springs, and the reservoirs are situated high above all possible sources of contamination.

This system furnishes North Conway, Intervale, and Kearsarge abundantly for all purposes except in very dry seasons, when, for a few days, it is not fully equal to the great demands for irrigation. This water has never to my knowledge been analyzed; but I have found it remarkably pure and free from organic matter, excepting after heavy rains, then for a day or two it is slightly discolored and there is a little deposit of vegetable matter.

Conway Village is supplied by the Conway Aqueduct Company, which takes its water from brooks in the hills west of the village. These are fed by springs, and the conditions are much the same as in North Conway. Some years ago, this

water was analyzed by Professor Angell and pronounced by him the purest public water he had ever examined. The supply is sufficient for all purposes.

The only other public system is in the village of Bartlett, where the water is brought from a brook west of the village about two miles. This furnishes good water in sufficient quantity for all purposes. Of the remaining houses, all but four are supplied by private systems, which bring water from springs and small streams situated in neighboring hills, and above sources of pollution from surface and subterranean drainage. In nearly all cases, these are sufficient for irrigation and ample protection in case of fire. The remaining four are dependent upon wells, some of which are not above suspicion, though I have never known sickness directly traceable to any one of them. I think I can safely claim that the first requirement of good sanitation is fulfilled. Certainly, if there is a section of country outside the mountains of northern New Hampshire that furnishes purer water to so large a percentage of its people, I do not know where it is to be found.

Pure air is one of nature's free gifts; and perhaps her generosity is nowhere better appreciated than among the hills of this state. But the abundance of this gift should not cause us to forget that there are dangers in possible sources of pollution, which increasing numbers make more potent.

First of these is drainage. This is a knotty problem to many of the large hotels, but I think in most instances it has been solved very satisfactorily. Out of the forty-five houses, mentioned under the head of water supply, twenty-five have systems of sewerage with closets and baths. These discharge either into cesspools or into some convenient water-course. While the discharge of sewage into underground receptacles is not an ideal method of its disposal, in many instances it is the only method available, and it has thus far been followed by no serious consequences. Some of the wells are ventilated and some are not. A few are constructed in pairs—one for the kitchen wastes and the other for the closets. This is the better plan, as the grease and other materials from the

sink form a coating upon the sides and bottom, which prevents free absorption of the fluids. The extremely porous character of our soil renders this method of disposing of sewage less objectionable than it would otherwise be. The sewers are well trapped in the main, also at sinks, tubs, and closets; and, in the latter, good ventilation is secured by extending the soil pipe through the roof. The earth closets are confined to small houses, and, where used, great care is taken to keep them cleaned. Fresh earth is freely supplied, and a free circulation of air is secured. Sinks, in most instances, are drained under ground, and either trapped or ventilation is had outside the building.

Much has been said against the use of waterways for the disposal of sewage, but this method of drainage for our large hotels has appeared to me the least objectionable of any. Each spring these streams are mountain torrents and their entire bed is changed by the force of ice and water, while during the summer months they are flushed by every heavy shower, and their rapid fall allows the free oxygenation of organic matter in short distances. I have yet to see any ill results from their use for the disposal of sewage, and unless furnishing water supply below the entrance of sewers, I would consider this means of drainage the safest and best at our disposal. The earth closet is safe if properly managed, but it requires a good deal of care and is inconvenient and unsightly; so much so that it has been abandoned wherever possible to introduce the water-closet system.

In all instances in which cesspools are made the receptacles for sewage, it is imperative that they be sufficiently large to insure against overflow. They should be thoroughly cleansed at least once a year, and ventilated by a pipe of sufficient height and size to prevent any odors of sewer gas about grounds and buildings.

The ventilation of summer hotels is not a matter of much concern. People do not go into the country to stay indoors, consequently everything is wide open and air has free circulation through open doors and windows from ground floor to

attic. Large open fireplaces in offices, parlors, and reception rooms furnish a ready means for the escape of vitiated air when, on account of inclement weather, doors and windows are closed, while at night, wide corridors conduct streams of fresh air through all parts of the house.

In the help's quarters the conditions are changed; as the season advances the volume of travel increases, reaching its height during the heat of August and September. Then everything is taxed to the utmost and the whole machinery is run under high pressure. Help is crowded into attics, over kitchens, wash-houses, carriage houses,—anywhere. In some instances the rooms are small, the passageways narrow, and the ventilation poor. In addition to this, the rooms are, in some cases, untidy and I have found a few almost filthy. What wonder then, where these conditions prevail, that under their depressing influences, associated with extreme heat and scant sleep, bowel troubles are sometimes epidemic among the help while the front of the house experiences no trouble whatever? I do not wish to be understood that the employees at summer hotels are overworked or not allowed sufficient time for sleep. On the contrary I believe their work is *not* extremely hard, and in some instances very light. But the conditions of hotel life, for them, are such that many do not take the time for rest and sleep they might, and those who would rest cannot, because others will not. It has appeared to me that too little attention has been paid to this matter, even by those who are particular that all other parts of the house are in first-class condition.

As far as my observation extends, the waste from the kitchen is carefully attended to daily or oftener, and storerooms, refrigerators, cellars, and pantries are kept scrupulously clean. The final disposition of this kitchen garbage can in some instances be questioned. When swine are kept for its consumption, unless at considerable distance from the house, the condition during the hottest weather does not fall far short of being a public nuisance; and I have known of some such places that were dangerous to public health. This

matter has received the attention of the health board in times past, which has resulted in much improvement. In my opinion there is opportunity for further improvement in this line; but changes which involve expense are sure to meet with strong opposition even when, in the end, the individual as well as the public is to be benefited thereby. A bad smell is not always a menace to good health, and the question frequently arises whether a bad odor from a certain locality is of sufficient importance to require action for its suppression. One occasionally finds a person whose olfactories are so acute that they appreciate the suspicion of a disagreeable odor, and whose imagination is as active in picturing resulting evils as his nose is keen in detecting a smell. Disagreeable odors from any source when so marked as to be a cause of discomfort to the public, become a nuisance and should be treated as such, even if not positively injurious to health; but if the extravagant demands of hypersensitive persons are heeded, the community is kept in constant turmoil, and soon loses faith in the whole scheme of sanitation.

I think a word may properly be said relative to the care and preservation of the natural scenery of this part of the state. The pine forests have *always* had great attraction for the summer tourists, and there are not many pleasant days that one cannot find many more enjoying their cool shadows and breathing deeply of their balsam-laden breath, than can be seen in the corridors and on the verandas of the hotels. To many, these groves are the chief attraction that brings them to the mountains, and they spend nearly all of their waking hours lounging on the carpets of pine needles, reading, or dreamily watching animal life and forgetful of the world outside. In too many instances these noble trees have been sacrificed in the interest of a few lumber dealers and at such a loss to the boarding interests that it has frequently occurred to me that the town or state had better have purchased these tracts of magnificent pines, now destroyed, which for years were the delight of *all* who came to the east side, and held them as public parks. Some hotel men, recognizing the value to

the boarding interests of this heavy growth, have bought and preserved large groves near their houses and keep them tidy for the comfort of their patrons.

But too frequently, where but a year or two ago were shade and beauty, are now only the old dry mantles of the noble trees that were victims of the ax in previous winters—a melancholy spectacle, unsightly, inviting the deposit of rubbish of all sorts and needing but a spark to become dangerous to surrounding property. This is not an ideal picture, it is a reality; and it is with increasing fear that I mark the gradual but sure destruction of these and other natural objects, which long have been a part of the beauties of this region. Hills once clothed are now naked; ledges and grottoes that have long been a delight to thousands of visitors, fade under the quarryman's hammer, and giant boulders are sacrificed for a few building stones.

These objects may not have been necessary to health, but they have gone far toward rounding out the comfort and happiness of the people who visit us. They have long been summer idols, loved and adored, and as they crumble, one by one, the appreciative turn sorrowfully away, never to return.

Perhaps I have strayed from my subject, and, to bring me back, some one may ask, What are the prevailing diseases in mountain resorts? My answer is, digestive disorders, principally. These are mostly caused by long journeys to the mountains in the heat of summer, and the accompanying irregular and often improper diet; by too free indulgence at the table and lack of sufficient exercise; and the pernicious habit of sitting upon hotel piazzas in the chilly evening air, as lightly covered as during the heat of the day.

Contagious diseases are not common. In five years' practice among the hotels of the east side, I have seen but one case of scarlet fever; and in that the rash was apparent the morning after the child arrived.

There have been but two houses infected by diphtheria. In the first, there were five cases with but one death. The source was unquestionably traced to the family dressmaker, who, just

before the family started for the mountains, went to visit a sick niece. It was afterwards ascertained she had diphtheria. The little girl of the family, whose dress she was making at the time, came down with a sore throat a day or two after her arrival in Conway. The case was treated as follicular tonsilitis until the day before her death, when the health board was notified that it might be diphtheria. There had been no isolation, and the mother, aunt, chore boy at the house, and one of the nurses contracted the disease. These recovered, The house was cleansed and closed for the season. That was five years ago, and the house hase been filled every season since with no further outbreak. There were no other cases in town that year.

The other case occurred in a boarding-house containing several families of small children—twelve in all. This case was traced to a package of clothing which an aunt had sent as "Just the things to be switched out in the country." They had belonged to her little girl who died of diphtheria. A few days after the clothing was unpacked and put on, the recipient came down with diphtheria and died. In this instance careful isolation prevented the spread of the disease, and the other inmates of the house, after a sufficient quarantine, were scrubbed and sent home. Their clothing followed after fumigation, and none of them contracted the disease. The house was cleansed and closed for the rest of the season. There has been no further trouble there. There were no other cases in town.

Typhoid fever is not so common in our summer resorts as is popularly supposed. I can recall but twelve cases in an observation of five years covering nearly every hotel and boarding house on this side. When one considers the large number of people that annually register at the different hotels (about 25,000 according to a careful estimate made by the board of trade of North Conway for the year 1891) this is not a bad showing. Eight of these were among the attendants. Of the other four, one was a young lady who came up from one of the islands in Casco Bay to a point above the mountains. She

arrived ill and finding trouble in getting a room at any of the houses she came to Lower Bartlett in a semi-conscious condition, and died in forty-eight hours. A pretty strong object-lesson for those who send typhoid patients long journeys home as soon as the disease is recognized.

As a conclusion to an imperfect treatment of this subject, I would like to offer the following suggestions: That the state board of health make a careful inspection of the principal resorts in the state, at such intervals as will best serve the boarding public; that all doubtful water supplies to health resorts be analyzed by the state chemist; that the local boards make an inspection of every hotel and boarding-house at the beginning of each season, and if found in good sanitary condition, a certificate be given to that effect, signed by the board; that we use our influence as physicians and sanitarians for a system of sewerage in every town where there is a public water supply; that we insist that the preservation of our forests and other objects of public interest is imperative, if we foster the principal industry of the state, and that we never send a case of probable typhoid fever a long journey where it is impossible to avoid it.

SUGGESTIONS FOR LAYMEN HEALTH OFFICIALS.*

By William K. Robbins, chemist of Amoskeag Manufacturing Company, secretary Board of Health, Manchester, N. H.

Once the human race divided itself into two grand divisions: the three learned professions and the ignorant masses. Owing to the meager facilities for education, only a favored few could receive the advantages for intellectual advancement, and there was a proper basis for the general sentiment that the wisdom and judgment of the world resided with them only and that the common people, the laity, might not enter their charmed circle to question the accuracy of their wisdom or the consistency of their actions.

Custom and tradition have brought this feeling all along down the pathway of civilization, and even now it sways public sentiment to an unwarranted degree.

But free schools, free libraries, free speech, and free press have obliterated the sacred circle and removed the mystic veil.

The laity have made progress far out of proportion to that of their professional brethren, and today any American citizen may easily have information, discretion, and judgment that the doctors of divinity, of law, and even of medicine are bound to respect.

It is not only the privilege but the duty of every one to be informed in regard to the fundamental principles of the various professions—now many times the original three—to the end that he may do his share in promoting the religious, moral, and physical health of mankind.

* Read before the New Hampshire Association of Boards of Health.

Disease and death no longer fall from midnight damps and angry gods. Incantations, conjurations, supplications, charms, and the miraculous powers of physicians have had their day. Rationalism has replaced superstition and empirical guessing has given way to scientific investigation. The recent advances in the comparatively new science of bacteriology bid fair to revolutionize the practice of medicine. They have already established a new departure in sanitation; have virtually made it a practical science and a useful art. It is now thoroughly demonstrated that a real, actual thing, a concrete substance, a microscopic living organism is the etiological factor in all decay as well as in all infectious and contagious diseases. In scarlet fever, yellow fever, and smallpox the specific microbes have not been differentiated, but doubtless will be as soon as some bacteriologist shall find a medium outside the body in which they will grow.

Where these are not, the diseases cannot be; with them the diseases may be produced at will. To battle with them is, therefore, the perfectly definite aim and business of sanitation.

The enemy has already been deprived of cover and brought into the open field for the fray. They know nothing of our charms and supplications. They cannot smell our assafœtida bags and they have neither fear nor respect for the pocket-worn horse chestnut.

Our starting point to their destruction is, therefore, to learn their life history, the conditions and products of their growth. We may not all become adepts in bacteriology, but any layman may acquire a fair understanding of its fundamental principles. Physicians do little more; very few attempt to do actual work, since the necessary time, facilities, and technical manipulation are incompatible with an ordinary practice. They, like health boards, must depend upon the results and verdicts of scientists or specialists in this line, many of whom know medicine only as they know law or astronomy. Hence every health official should read some of the many good books on the prinicples of bacteriology.

The scientific terms are not so many nor so formidable as

one might expect. The chapters on the mechanical technique may be a little tiresome, but the bulk of the work will be an entertaining and interesting revelation. Some reliable medical journal should also be read, and a close watch kept upon the reports of other boards of health, especialy those of large cities, which often contain much valuable and original information wrought out in their bacteriological departments; and finally, for specific guidance, the laws, ordinances, rules, and regulations of the state and local board will be ever at hand.

In all we have exactly the same sources of information that physicians have, and if we digest the whole with a liberal allowance of that old fashioned common sense that would find a haystack before looking for the needle within it, we will have a basis of judgment that will command respect among both lay and professional critics.

Although sanitation is a comparatively new element in municipal affairs, many of its minor activities are already commonplace; but among the important subjects that call for better general knowledge on the part of the health commission are antiseptics which retard the growth of germs and disinfectants which destroy them.

The general conditions of life are moisture, warmth, and organic matter for food. The conditions of death—heat and poisonous substances.

Taking advantage of these facts and conditions then all unknown, the ancient Egyptians preserved their mummies, and our grandmothers saved many fruits and vegetables by drying. The present tremendous system of cold storage is successful in keeping perishable materials for long periods of time by reducing the temperature below the point where bacteria will grow.

Almost every soluble chemical substance will prevent growth at some given point of strength or dilution, as vinegar keeps pickles, sugar and fruit juices keep jams and jellies, boric acid keeps milk, alum makes a poor flour work more like a good one, and even the soda present makes fairly safe the piece of soap you use in common with everybody at the hotel. In

these cases the germs are not killed, growth is simply prevented, since if the moisture is restored, the temperature raised or the chemical substance diluted, growth will at once proceed. The treatment, therefore, is only antiseptic. This should not be confounded with sterilization or disinfection, which aims to destroy all germs so that no further growth from them is possible.

The cheapest destroyer of these organisms, and the natural one, is the direct light of the sun. Where this is not available we must depend upon artificial means such as heat, dry or moist, and chemical substances either as solids, liquids, or gases. Dry heat, being effective only when far above the boiling point of water, is little used except where actual combustion is available.

Moist heat is effective at boiling and if employed below that, say 160°, it must be repeated several times. In the form of steam, where it may be confined, the effectiveness is very satisfactory.

When chemical substances are used it is absolutely necessary that they be brought into actual contact with the germs to be destroyed.

Dry substances or powders of any kind may be promptly rejected at all times, because the necessary contact cannot be relied upon. They may act as temporary deodorizers by absorbing foul gases or covering up the odor by one more noticeable. If used at all, dry road dust is as good as anything.

With liquids or chemicals in solution, articles or places to be disinfected must be thoroughly saturated lest some germs escape uninjured.

With gaseous substances the ever necessary contact is still more difficult, since the air surrounding the germs is not replaced by a gas as by a liquid. Where the air can be removed, as in a vacuum, the action is prompt and effective and the penetration excellent.

Such application has been tried at the port of New York with most satisfactory results.

In normal atmosphere larger quantities of a gas are necessary, and with the best confinement attainable the exposure must be long to permit natural diffusion to replace the air with enough of the poison to produce a fatal result.

As this is extremely slow in small spaces such as pockets, folds of cloth or paper, etc., no deep penetration should be expected.

In the light of these facts, how utterly unreasonable and useless it is to send a person clad in all the wraps suitable for severe winter weather into a room where sulphur fumes are being generated to remain only as long as one can hold the breath, and yet within the past decade this farcical performance was enacted at every important railroad station between Boston and Montreal and all classes went about with comfortable assurance that they were being thus protected against smallpox.

Probably the most serious difficulty confronting health officers in their efforts to protect the public health is the non-co-operation of their fellow men. Of these many varieties have received attention at one time and another but there remains a most important class : the practising physician, whose sins of omission and commission professional etiquette decrees may be reviewed publicly only by laymen.

Being directly concerned with the treatment of diseases, they have a realizing sense of the wisdom of sanitary measures and precautions, and the great majority of them do live up to the ideals of an occupation devoted to the saving and prolonging of human life. But then there is a considerable minority, many of whose sentiments and professional acts provoke the protest of meek and modest laymen. Theoretical sanitarians they must of necessity be, but whether practical or not, may be judged by a few instances which have fallen under the notice of the Manchester board of health.

About two years ago a letter was mailed to each physician practising in the city requesting that all cases of consumption be reported to the board of health, the same as other contagious diseases.

Up to the present time no cases have been reported although the deaths from that disease number 84 for 1897. The proportion of doctors who enrobe while attending patients sick of a contagious disease is as yet extremely small.

A considerable number of cases of infectious and contagious diseases have been found that were not reported according to law.

To such a case the board of health sent the city physician, who reported a bad case of diphtheria. The house was placarded and declared in quarantine. The attending physician advised the people to pay no attention to either. Within three days the child died, and the certificate giving diphtheria as the cause of death was signed by that same attending physician.

Many of our cases of scarlet fever are certified as recovered and free from contagion in less than four weeks and several cases in one week from the beginning of sickness. Repeatedly have our inspectors gone to fumigate and remove placard on a certificate of recovery and found the patient in the midst of desquamation. In a recent instance it was found that the doctor had not seen the patient for two weeks, but signed the certificate of recovery at his office. People often complain to the inspectors against being quarantined. They say, "The doctor comes here, handles the patient, and goes directly to the house of a neighbor to visit a patient sick of a non-contagious disease, without changing clothes or washing his hands." A case of diphtheria is reported. We placard the house. The patient dies after a few days, and the people want a public funeral. Then we get a letter from the physician saying the disease was not diphtheria but bronchitis.

A physician uses a spoon in examining a case which he pronounces true diphtheria, takes the spoon from the patient's mouth and tosses it upon a table among others, and without washing of hands or changing of clothes leaves the house.

A doctor goes uncalled into a house placarded for diphtheria, being acquainted with the people. Examines the child, says it is not diphtheria, and without washing the hands proceeds

with his calls upon patients. The child dies of diphtheria within twenty-four hours.

The board of health issues a permit to work to a person in a house where a case of contagious disease is safely isolated, with the distinct promise that there will be no communication with the sick room. When the inspectors discover the violation of the pledge it is excused by saying the doctor said it was all right.

A doctor desires to use antitoxin but does not, because no one will pay him back the $3 that a syringe would cost. Another seriously suggests that the board of health buy a syringe for the administering of antitoxin and keep it to lend to the physicians !

Only this winter the inspectors were informed that their fumigation was quite unnecessary, as the doctor had burned a small candle in the house, and told them all was safe.

No; we cannot prove to the satisfaction of the court that contagion has been spread by this disregard of sanitary precaution on the part of some physicians. Neither do we need the whip of legal penalties to induce them to make their practice conform to their own better judgment.

The spread of general information will soon enable the masses to bestow upon each practitioner a reward of patronage according as he has been faithful to his noble calling.

Not since the days of ancient Greece have natural growth, physical development, health of mind and body been so eagerly sought by each and all. Health dress, health food, gymnasiums, athletic games and all that conduces to physical comfort and strength are intelligently and generously patronized; while all the evils and baneful environments are just as earnestly considered, to the end that they may be avoided.

Notwithstanding this phase of sanitation, which is something in the nature of a fad, it has also a strictly business aspect. Business has been defined to be "man wooing man." For this purpose more depends upon the individual than the occupation he follows. There is scarcely ever a difficulty in deciding what ought to be done.

The great questions are, How much, when, where, and under what conditions ? The money value to the individual and the community of clean streets, pure air, food, and water, sanitary schools and dwellings and a low death rate, it is the business of the successful health officer to demonstrate.

While, therefore, we may not hope to approach the physician's judgment in advanced sanitary matters, here we may emulate him in the exercise of that courage, consistency, forbearance, and patience necessary to gain such respect and confidence of the community for health boards as will enable them to battle successfully with disease and death.

ABATEMENT OF NUISANCES BY LEGAL PROCESS.*

By Don H. Woodward, attorney at law and member board of health, Keene, N. H.

The experience which the board of health has had in Keene during the past few years may be briefly stated in illustration of my subject. In the years 1882 and 1883 the Waring system of sewerage was put in, covering the principal streets of the city. It has been greatly extended since that time, so that now about seventeen miles of sewer pipe have been laid at a cost of about $86,000. In 1883 the contract for putting in the sewer was completed, and in August the city took possession of it from the contractors. No connections were made with it in 1883. In 1884, and for years prior thereto, there had been old drains, made some of stone and some of wood, running through various streets. These drains had taken the surface water and sink water, and often were in a filthy condition,—especially in dry seasons, when there was no surface water to pass through them.

The first thing to confront the board of health was, that some of our people claimed (and I think rightly) that as they were connected with these old drains, which had been in use as public sewers for more than twenty years, the board of health could not force them out of one public sewer into another public sewer. Thereupon, on the recommendation of the board of health, the city councils discontinued the old drains as public sewers, and this left the new system as the only public sewers in the city. In July of that year the board sent out notices of the action taken by the city councils to

* Read before the New Hampshire Association of Boards of Health.

the owners of property by the side of the old drains, and eighty-three houses were connected with the new sewer that year, and this was about all the plumbers could accomplish.

In years following it became apparent that there were many property owners on streets where the public sewer was laid that would not connect their premises therewith. It therefore became necessary that the board of health should invoke the law. There was no other alternative. The policy adopted was the use of the criminal process.

Now by Sect. 8 of Chap. 108 of the Public Statutes, when the public sewer comes within 100 feet of a man's premises (not 100 feet of his privy or sink) and his premises are not provided with suitable drains for conveying the sink water away, he may be prosecuted; and under the same section, if his buildings are not provided with suitable privies and vaults, properly ventilated and constructed and kept in a sanitary condition, he may also be prosecuted, if he does not connect his premises or buildings with the public sewer; under the same section of the law, again, if there is no public sewer, he may be prosecuted for not properly conveying away the sink water or for not having privies properly constructed. So there are at least four different kinds of criminal complaints that may be made under that section of the statutes.

But, however, before proceeding with any complaint in this way, a written notice is to be made and given to the owner or occupant of the premises, briefly stating the cause of the complaint, that the same is a nuisance or that it is dangerous to health, and requesting the owner or occupant of the premises to connect his sink or his privy with the public sewer, if there is one within 100 feet, or if not, requesting him to abate the nuisance in some form agreeably to the language of the statute. The notice should prescribe a limited time in which it is to be done. The time so limited in the notice is not fixed by law, except it must be a *reasonable* time. The notice itself is important, because it is the foundation of criminal proceedings,—proceedings which cannot be begun without it,—and therefore it should be accurate. Remember, too, if there is to

be a trial the notice must be proved, and therefore a copy should be kept for that purpose.

If there is no public sewer, and it is to abate a privy as a nuisance, or a sty for swine, Sect. 10 of the same chapter is the better one, yet the notice is to be given in the same way as in Sect. 8. The fine in these cases is $10, or less if the court thinks proper, for each day's neglect.

Do not allow yourselves to think that in our section of the state there is any amount of litigation in this line, for there is not. There have been only three or four cases in my experience of about a dozen years; and only *one* that was actually tried, and that was settled by the defendant before it reached a further hearing. It will not answer to allow the people to think that the orders of the board of health can be disregarded. If any person feels aggrieved by any order of the board, he should generally, if not always, be allowed a hearing, if he wants it. In this way orders may be modified, time extended for something to be done, and a fair and intelligent result obtained.

The other sections of chapter 108 apply in other contingencies, but sections 8 and 10 cover a large proportion of cases.

There is one section, however,—Sect. 4 of the same chapter,—wherein it is provided that the board of health may notify the owner of any building or inclosure to remove or destroy any nuisance or other thing therein deemed by them, on examination, to be injurious to the public health, within a time limited; and in case the owner or occupant, after such notice in writing, shall neglect to comply therewith, the health officers may forcibly enter such building or inclosure and cause the nuisance to be abated. The expense of this procedure is to be, or can be, collected of the owner or occupant by an action in the name of the town or city. There is no impracticability in using and applying this law in proper cases, but my opinion is, to avoid its use in all cases where there may be another course of procedure. Not simply because a person having made a nuisance ought to abate it, but because the rights of property are so clear to man, that when his property

is invaded by the health officers, even though for the lawful purpose of abating a nuisance, the owner will get in as high dudgeon as he ought to be, and afterwards, when sued for the expense, he generally contests the action, and entails an expense upon the town whether the town recovers or not. This has been my observation, but not experience, for we have never used that law for such a purpose. It is, however, a useful statute, and sometimes needed; as, for instance, the cleaning out of a ditch upon land over which the owner has full control. There would seem to be no reason why the statute should not have been made to have the owner of a filthy ditch prosecuted in the same way as the owner of a filthy sink drain; but it seems that the law is not so written.

The legislature has wisely given great powers to the health officers for the protection of the people, and nowhere has it ever been said that these powers have ever been abused; unless it may be so said by reason of their non-enforcement. There is no difficulty in having a sanitary condition in any town in New Hampshire. If any such supposed difficulty exists, the trouble is with the officers and not with the law.

Thus far these remarks have been confined to the statute law of the state, which law applies to almost all matters of complaint, respecting unsanitary conditions. There is a class of cases where the statute does not furnish the best course of procedure, or, if used, it will not always produce the desired result. In this class are such institutions as slaughter-houses, soap factories, tanneries, and the like, which are not nuisances, *per se,* but oftentimes are, depending much upon their location. In this connection comes the question, What is a nuisance ? It has been defined to be "anything wrongfully done or permitted which injures or annoys another in the enjoyment of his legal rights."* In law there are two kinds, private and public nuisances. In the one, an individual is harmed in the enjoyment of his lands, and in the other, many persons are harmed or annoyed by noisome odors or in some other way. In the case of a private nuisance the remedy is usually by bill in equity praying for an injunction or some

* Wood's Law of Nuisances, 2d Ed., p. 1.

other right the complainant may be entitled to, and in the other case of a public nuisance the remedy is by indictment by the grand jury or by information filed in court by the attorney-general or county solicitor, which has the same effect as an indictment. In these remarks let it be understood that we are considering cases now under the common law, and not under the statutes. There is such coincidence of law and fact in many things between what is a public and what is a private nuisance, so far as this paper may extend, the distinctions will not be discussed. We come back again to the question, What is a nuisance? The definition does not materially help us. "The question of nuisance or no nuisance is always a question of fact."* There may be many facts that enter the question. For instance, suppose that it is a slaughter-house under consideration. Its location, its proximity to dwellings and public ways, the number of animals slaughtered, the care taken of the place, may all be ascertained with reasonable certainty, and yet there may be a doubt what ought to be done. It would seem, therefore, that the *degree* in which it is a nuisance ought to determine. A slaughter-house, a soap factory, a tannery, are useful institutions, and when located in uninhabited places they never are nuisances when properly managed, but when located upon thickly settled streets, they are. And here it might be suggested that in former times the courts held that these establishments located in sparsely settled places, where they had a right to establish them, and nobody complained, and afterwards owners of land adjacent or near thereto placed dwellings in which to live, that these persons *came* to the nuisance and they must endure it. This is an old doctrine, and it is wonderful how many people seem to understand it to be so now. But in more recent years, when our cities and villages are spreading out and reaching far from their former occupancy, the courts have reversed the old doctrine found in the books, either from necessity or from the fact that an owner may erect such buildings as he needs upon his own land, if he

* Hunt *v.* Mayor of Albany, 3 Paige N. Y. 218.

does no harm to his neighbor. An instance to illustrate is found in a case in New Jersey,* where a person erected his dwelling house within six inches of his neighbor's privy, and the filtrations from the privy ran and leaked through into his cellar, and the court ordered, upon a bill of equity, that the owner of the privy must cause it to be stopped.

In a case for slaughtering cattle in the city of New York,† the defendant claimed that as the plaintiff did not come into the neighborhood until after the slaughter-house was established, they were estopped to complain of its effects. The court said that when the slaughter-house was erected it was remote from the thickly settled part of the city, but the city had grown up to it, and the necessities of the population required the occupation of the lots in its vicinity for dwellings. When it was erected it incommoded no one, but now it interfered with the enjoyment of life and property; and that as the city extends, such nuisances must be removed to the vacant ground beyond; and that there was no necessity for slaughtering cattle in that part of the city which was occupied by valuable and costly dwellings. In an indictment for a common nuisance it is no defense that the business constituting it was established remote from habitations and public ways, and that the persons suffering from it afterwards built their dwellings within range of its stench and noisome effects.

And in a case in Massachusetts,‡ the court held that it made no difference even if it was established more than twenty years before dwellings came to it. In other words, no length of time legalizes a nuisance.

The reason of proceeding by indictment or information in this class of cases, is, that the court can impose a large fine, conditioned that if the defendant abates the nuisance in a time limited by the court, all the fine, except a nominal sum and costs, shall be remitted, and such an order seldom fails to have the nuisance abated.

* Perrins *v.* Taylor, 43 N. J. Eq. 128.
† Brady *v.* Weeks, 3 Barb. 156.
‡ Com. *v.* Upton, 6 Gray 473.

In addition to the statute and the common law of the state, health officers of towns may make regulations for the prevention and removal of nuisances, and such other regulations relating to the public health as in their judgment the health and safety of the people may require; and when approved by the selectmen, recorded and published, the same shall become operative. So if the people of any town or city are discontented under the law as enacted, they can make further law to meet the exigencies of their case, and if such law or regulations are not obeyed, there is a fine of $10 that may be imposed upon complaint in a justice or police court. And again, in addition to all this, the state board of health, looking over the whole field, as it does, from its weekly reports received from all parts of the state, can make any further regulation for the health and safety of the people, or amend any existing rules or regulations as in their judgment the public good requires. These regulations are to be enforced by health officers agreeably to the language in which they are written. The legislature did as much as to say that the health and safety of the people of the state is of so much consequence that if the statutes are insufficient, you may make the rules and regulations you want in this direction, and the courts of the state shall be open to enforce them.

The system of the law has been so perfected through these years that there is not, generally, any want of rules or regulations beyond what the state board of health have promulgated. This is the experience with us. Other places, however, may find it different.

The board of health of a town or city has no powers as such, of course, outside of its own town or city limits. In cases where water is taken for a city from another town, as it is with us, and decaying animal substances, or other poisonous matter, are left by some one so near such water in another town as to be likely to contaminate it and render it unfit for domestic use, although the board of health of the city, as such, may not have the power under the statute to enter and abate the nuisance, yet as citizens under the statute they can make a

complaint and cause such person to be arrested and fined or imprisoned, and as citizens, if seriously affected by such a nuisance, they may enter and abate it. In so doing, it is the exercise of the rights of necessity, and is sustained by the common law.* No one so affected by a substantial nuisance is obliged to wait for the slow process of the court, but in a reasonable manner may enter and abate it. It is similar to the law of self-defense. It requires no statute to give this right effect, for it has existed in all ages, and it is very doubtful if any statute can take this right away.

In this bird's-eye view, as it were, of the powers vested in our boards of health to gain and keep a sanitary condition, it is plain that the way is clear and easy to accomplish the results for which the health officers are appointed. And if without malice the work is done, the people will appreciate it.

*Haley *v.* Colcord, 59 N. H. 8 9, 3 Blackstone.

SEWERAGE IN VILLAGES.*

By Prof. William T. Smith, M. D., dartmouth medical college, hanover, n. h.

Hanover is a village of twelve hundred inhabitants, including four to six hundred students. It covers an area of about a mile in length and one half of a mile in width. It is on a plain whose average height above the Connecticut river is one hundred and seventy feet. This plain is quite flat except that in its southeast quarter it slopes down to a level twenty feet below the rest.

The soil is chiefly hard clay, but the southwest quarter is sandy.

Twenty years ago there was no sewer or public drain in the village except in the southeast quarter, where there were two covered stone drains. Sink water and other slops were distributed over the surface or collected in cesspools. The old-fashioned back-house had no rival and on the grounds of rich and poor bore its silent witness to the radical equality of mankind. The stone drains were ineffective and gathered filth. Of course we had typhoid fever every fall. All New England and, indeed, all the temperate zones did and still do have it. Sanitary science may eradicate it in the future; it has not yet done so. But twenty years ago the number of cases in our village was much less than in earlier times when there was a swamp back of the college grounds and other wet lands were undrained. Being on the whole a very healthy community, we might have been contented with our sanitary condition but for an epidemic of typhoid fever which occurred in 1880, during which about one hundred persons had the disease, including many students. The friends and patrons

* Read before the New Hampshire Association of Boards of Health.

of the college became uneasy. Anxious fathers were inquiring into our sanitary conditions. That useful class in the community who are set like watch-dogs to find out the faults and imperfections of their fellow men, raised a voice of sharp criticism, and all this led to an effort for improved drainage. There was no official body to do it. There was no public money for it. But the college felt that something must be done. Accordingly a paper was circulated among those citizens who generally furnished the money for public improvements, which read as follows :

"In view of the large amount of sickness that has been directly traceable to the defective drainage in certain parts of this village, it has been thought necessary to construct several large covered drains. The trustees will give a certain amount conditioned upon a like amount being given by citizens. The undersigned agree to give for this purpose the sums set opposite to their names."

Subscriptions ranged from fifty cents to three dollars. One man gave five dollars. The total was sixty-nine dollars. So small was our beginning. The college more than doubled this sum and under the direction of Prof. Robert Fletcher, now of the state board of health, and Prof. C. H. Pattee of the state college, our first sewers were laid. They put down one thousand feet of 6-inch glazed tile, and nearly the same length of unglazed tile in the same ditch to take surface water. They laid two systems which drained some wet land back of the college library; took the waste from the gas works; served the hotel whose drainage had been discharging under a large livery stable in the center of the village; drained the livery stable and stagnant pools near it, and served a number of private houses. These drains were imperfect. In a part of their course they made use of the old stone drains and they were eked out by plank drains. They terminated at the edge of the village, close to its residences on the open surface of a field. They took only surface water and sink water. We had not a water supply sufficient to flush them and consequently bath-rooms and water-closets were not thought of;

these were forbidden, too, by the nearness of the outlets of the drains to the streets. But their small service was a boon to the village. They dried the land and abolished odors and conveyed away a vast deal of filth from that quarter where there was the most sickness. Since their construction there has been no epidemic of typhoid fever and no prevalence of diphtheria among us.

No farther sewerage was attempted for eight years. We had good health and made shift to get along with our cesspools and surface drainage. We had for many years a water supply of the best quality, but it was limited in amount. Forty gallons a day was a share for a family. This was not enough to flush sewers if we had them. It was believed that sewer pipes if generally laid and used for all purposes would be simply elongated cesspools which could not be cleaned out. Some of our people preferred cesspools to sewers, because they wanted the sewage for use on their gardens. There are always good reasons for resisting improvements.

But finally a group of progressive men in the north end of the village determined to have a sewer. They formed a company of ten shareholders and contributed one hundred dollars each. They surveyed a course a little over three thousand feet long with a grade at the least of one foot in a hundred, and at most two feet in a hundred. Their outlet was in a pasture so far from the edge of the village that no nuisance was apprehended. Their ditch was about three and one half feet deep. At one or two points it was for a short distance only three feet deep. For one hundred and fifty feet going through a bank it was from eight to twelve feet deep. The bottom was carefully leveled by the engineers so as to have no sags in the pipe. Eight-inch tile was used and pains were taken to have the joints cemented tight. Written permits were obtained from private owners whose lands were traversed. T's and Y's were put in at every one hundred feet to give access to the pipes for cleaning, but no manholes were made. The whole was paid for by the capital stock and there was a remainder of one or two hundred dollars in the treasury.

Financially, this result would have been satisfactory had there been no income. Each of the shareholders got his sewerage for the yearly interest of one hundred dollars, with a small out-go for repairs added, thus far practically nothing. But at the beginning six householders entered the sewer at a rental of five dollars a year. This number has gradually increased until now there are nineteen besides the shareholders, making in all twenty-nine who enter.

The success of this enterprise disposed effectually of several bugbears that had stood in the way of sewerage in our village. First, the bugbear of expense. We thought we could not afford to build sewers. Sewerage costs now five or six dollars a year for a house, not as much as the old cesspool system cost us.

The second bugbear—we thought we had not sufficient water to flush sewers. The first sewer company met that difficulty by compelling each householder who entered to turn in his roof water. With a fall of from one to two feet in a hundred there was always a considerable stream flowing in the pipes. There has been as yet no stoppage in the main and only two or three entering pipes have been obstructed by grease. We feared that the pipes would freeze in our cold climate, as in some places they are not more than two and one half feet under the surface. But the water which feeds sewer pipes is always warm and it does not freeze when the earth is solid around it as long as there is a steady flow.

The sewer company whose enterprise has been described served only the north end of the village. The West Side Sewer Company took up the work. A householder in the west side was weary of cesspools and back-houses. He had suffered semi-annually for years the enormous nuisance incident to cleaning them. Twice a year the gases and stenches of the uncovered abominations had pervaded his premises and those of his neighbors. On one occasion they had sickened his baby. He had wearied his soul trying to get men to do the repulsive work and had paid them extortionate prices for it. How humiliating the whole matter of human excretion! Man

spends a large proportion of his energy in defending himself against his own filth, and the degree of his civilization is indicated by the degree of his success in this contest. This householder noted that the contour of the land about him made possible a sewer; that it would not only serve him, but a considerable section in his vicinity. As he thought on the plan, its possibilities extended, and he saw with surprise how nature had prepared the way for a sewer system which reached out to a large part of the village, until he remembered that nature had been draining this plain one hundred and fifty feet above the river for ages, and that her draining had shaped the surface and made the gullies and slopes that met so well the plans of the constructor. This householder got others to join him. It was hard to secure the requisite number, for no one wanted to risk more than one hundred dollars in it, but thirteen at length came in and the company was organized. The whole undertaking was vastly simpler, of course, because the North End Company had shown us how to do it.

Several things are essential in a sewer system. First, a sufficient fall. The more fall, the better. Well constructed sewers in the city with plenty of water to flush them do satisfactory service with a fall of only four inches to a hundred feet. But it is better to make the minimum one foot to the hundred. It is convenient to follow the street, but not always possible.

Second, it is essential to get right of way through such private property as may lie in the line of natural drainage. This is often difficult; sometimes for a private company impossible. It is aggravating to have your scheme of benevolence and practical utility blocked by a contumacious landholder, but he can often do it. At one point we ran against an irritable Irishman, who filled the air with asseverations that we should not go through his land. Argument had no effect on him. There was no way around him and we were almost ready to hand our plant over to the authorities to make a public system of it and condemn the necessary land. But when they took the matter up and the Irishman appeared before them, he was sufficiently impressed to yield on condition that we pay him

certain money and give him free entrance into the sewer. At our rates this amounted to a gift of one hundred dollars in addition to the advantages which he, in common with the rest, gained from our work.

Third, the mains must be so laid that they will be accessible to the houses along the line. The main must be enough lower than the house to permit the house connections to lie far enough under ground at the start and to fall toward the main. Crossing the property of others with house connections must be avoided as far as possible.

These conditions can generally be secured by careful planning because of the fact before referred to, that unless your village is located in a swamp, the surfaces have been shaped by water, and so natural slopes for drainage have been formed.

Of course the services of a competent engineer are indispensable to perfect details.

The west side sewer had great natural advantages. For a space of one hundred feet only, the fall is but one foot to one hundred. Nowhere else is it less than two feet, and it is in parts as high as ten feet. The dish-towels and other miscellaneous articles which are sure to get in are rushed down such a slope with no delay, and the fluids have not time to freeze. A large portion of the village has natural access to it. There is over a mile of main converging to its single outlet.

And it discharges into the river. Whatever criticism may be justly made on this disposal of sewage, it is for the present the most complete and inoffensive and satisfactory. This company charges a rental of six dollars a year and its financial condition is good.

It has had but slight expense for repairs and few accidents. Shortly after it was laid there was a tremendous rainstorm which sent a torrent down the highway in which was the lower portion of our ditch newly filled. The water got started in the ditch and in a short space of time the pipe was laid bare for many rods. The highway surveyor filled that for us. We had a freeze-up in the first winter, owing to imperfection in

the outlet, but no damage was done. The sewer has been in successful use for six years.

Three other sewers have been put in since 1892 on similar plans. We now have over three miles of sewer pipes in our village, not including private connections.

Our experience demonstrates :

First. That any village may have a sewer system.

Second. That the cost of such a system to each householder is small, very little more than the cost of building and maintaining cesspools.

Third. That such sewerage diminishes sickness, especially typhoid fever and diphtheria.

While we are pleased with our progress, we are by no means satisfied. I will refer briefly to the defects of our present system. Two of our sewers discharge into the river. It is not right to defile our streams with sewage. The beautiful Connecticut should not be subjected to such base uses.

But the towns along its course are all doing it. Our sewage in so large a volume of water, about one thousand cubic feet per second, does not make any appreciable difference. True, it might make a difference to those who might drink the water below, if any disease germs, as, for example, those of typhoid fever, were contained in it. These remain active long after the water has purified itself of the ordinary filth of sewage. Such germs should always be destroyed by disinfectants before the fluids containing them are poured into a sewer, and waters of a stream into which sewage has been discharged should not be used for drinking unless it has been effectually sterilized.

This is the best we can do at present. In the future we ought to do better.

The other sewers discharge on the surface of the ground, all at a considerable distance from residences. They have, however, been complained of. The owner of the land upon which one of them discharges has protested so strongly that the company is planning a new line to empty into the river. The steady stream which issues from the outlets, gray and

foul, finds its way into the little brooks that run through pastures and meadows. It carries its odor. Where cattle have access to it, they drink it. It is offensive to owners of land and in a degree a nuisance.

The methods of disposing of sewage on the spot, which have proved practical, are: First. Broad irrigation—spreading it over the surface of lands under cultivation.

Second. Sub-soil irrigation—spreading it by means of porous drains under ground.

Third. Downward intermittent filtration, first demonstrated with success at South Framingham, Mass. This consists in pouring sewage upon sand filter beds, shifting the flow from one bed to another and so making it intermittent. The sewage is decomposed by bacterial life. This is a practicable method for any village that can find sand banks at the natural outlet of its drainage. If the sand filter beds have to be made by hauling, it is too costly for small communities.

Fourth. Bacteria beds. This is a modification of the Framingham plan of sand filter beds, the difference being that cinder or coarse gravel is used instead of sand and the action is more rapid.

Fifth. Septic tanks. These are a late device on a new principle, or, rather, on an old principle which was partially applied in the cesspools we used to have. They depend on the action of bacteria like the filter beds, but on the anaerobic bacteria (living without air). These tanks are made absolutely air tight and sewage poured into them undergoes rapid decomposition. Gases are formed which find exit through pipes above the surface of the fluid, and being combustible, maintain there a constant flame.

In either of these processes, a stream of foul and dark sewage enters the receptacles at one part, and from another side issues a stream of clear, pure water. The offensive contents have undergone chemical transformation and the purified water goes on its way.

These or such as these are the true methods. Simply to remove sewage from under our own noses, transferring it in

its noxious identity to other places, is a makeshift. It should be rendered harmless by its makers. This cannot now be done in villages because the necessity of such disposal is not sufficiently apparent to make our people willing to pay the cost. But we shall appreciate the value of sanitation more and more. Our sanitary engineers will devise cheaper processes, and the time will come when every community will reduce its sewage on the spot to its inoffensive elements.

THE PROTECTION OF DOMESTIC WATER SUPPLY BY STATUTE.*

By John C. Bickford, attorney at law, member board of health, Manchester, N. H.

One of the absolute necessities of life, and the one in which above all others purity is of vital importance to the maintenance and preservation of good health, is the water used for drinking and domestic purposes. With the use of impure water dangerous epidemics make early and frequent visitations, and the utmost skill of our best physicians is often inadequate to stay the hand of death until whole communities are clothed in the somber garb of mourning.

Forty years ago the legislature of our state made provisions whereby pure intoxicants could be furnished to our citizens, and nearly thirty years ago severe penalties were provided for the punishment of persons who should adulterate any spirituous liquors, or who should sell any adulterated food preparation, or use in the preparation of food for others than themselves any substance injurious to health, and from time to time since numerous additions have been made to our laws designed to protect us from the use of impure and adulterated matter in our food, and state officers have been vigilant in the prosecutions of the vendors and users of oleo and other imitations of genuine food supplies, regardless of the fact that chemical analysis showed them to be as healthy as the article they were supposed to represent.

Stringent and effective laws for the protection of property rights in every direction, from the peculations of the crow and woodchuck upon the crops of the farmer to the granting of

* Read before the New Hampshire Association of Boards of Health, June 30, 1898.

the right of eminent domain to manufacturing corporations, have been enacted, and pages in our statutes have been devoted to the preservation of fish and game in the interests of our sportsmen, and general and special legislation has been had for the promotion of almost every private interest, while our schools and public institutions for the development of the mind and preservation of our morals have received year after year due and liberal attention. But the protection of the purity of that which should constitute at least one half of the sustenance of the human body, was not considered of sufficient importance to demand direct legislation until 1885, and then eight lines contained the substance of all that was deemed necessary for the protection of the public health in preserving the purity of the waters in the reservoirs from which cities, towns, and villages obtain their water supply for domestic uses, and today the gist of the statute law relating thereto is found in section 13 of chapter 108 of the Public Statutes, which reads as follows: "If a person shall place, leave, or cause to be placed or left, in or near a lake, pond, reservoir, or stream tributary thereto, from which the water supply for domestic purposes of a city, town, or village is taken in whole or in part, any substance or fluid that may cause the water thereof to become impure or unfit for such purposes, he shall be fined not exceeding twenty dollars, or be imprisoned not exceeding thirty days, or both."

In 1891 a special act was passed by the legislature for the protection of the waters of Lake Massabesic (from which Manchester obtains its water supply) from sawdust, and in 1895 a general law was enacted for the protection of the purity of ice used for domestic purposes as well as water, and giving certain powers to local officers to make reasonable rules and regulations regarding the same.

Power has been given by statute to state and local boards of health to make such rules as they deem necessary for the protection of the public health, and when properly approved and promulgated they became in a certain sense laws binding upon the public, and are respected and obeyed by a portion of

the people as such, and those relating to the subject herein mentioned do good work in preserving the purity of the water in our reservoirs and maintaining cleanliness on the premises adjacent thereto.

Nevertheless, they fail to impress the would-be wrongdoer with the dignity and power of a statute enacted by legislature, and prosecutions for the violation of such rules are attended with difficulties which do not arise where the provisions and penalties are provided and plainly set forth by statute law.

In the former case the legal establishment of the rules must in each case be proven in court, and must be proven by record, and it must be shown that the law has in all its various requirements been complied with, and not only that, but the fact of whether the rules are reasonable or not may be questioned; if not by the justice of peace or the police court, it may be raised on an appeal to the supreme court, which is, as perhaps it should be, always jealous in guarding the rights of the individual, and seldom, if ever, overlooks a flaw in the adoption of the rules of local boards or the enactment of local ordinances, and in doing this the court simply does its duty: for no man should be punished by illegal process, or for the violation of a law that was not legally adopted, and when, as it oftentimes happens, legislative enactments which have been given due and careful consideration by the best legal talent of our state fail to stand the test of the judgment of the supreme court, it is no wonder that the rules and regulations of our cities and towns and the local boards thereof are often found defective and of no avail.

Difficulties in the protection of water reservoirs by local boards of health may arise in various ways, one of which might be the fact that the boundaries and tributaries to such reservoirs are in different towns, and consequently under the control of two or more local boards, having widely different rules and regulations.

The city of Manchester furnishes an illustration of what might, but which happily does not, exist to any serious extent. As I have already stated, the water for our city is taken from

Lake Massabesic, the larger portion of which is located in the town of Auburn, and consequently in another county, and on the shores of the lake there are more than a hundred cottages used by their owners as residences (or rented to others) during the heated term, and many of them are used as places of recreation during the whole year.

The boards of health of Manchester and Auburn happily have no differences of a serious nature, and are united in a desire to preserve the purity of the waters of the lake, and have each adopted a code of rules, which, if strictly enforced in the spirit of their full meaning, would prevent the pollution of the water to any appreciable extent. But suppose the board of the city of Manchester had adopted the code of rules now in force, and the board of the town of Auburn had said these rules were too stringent, "that sink water on the Auburn shores will not affect water taken from Cohas brook (the location of the intake of one of our daily supply reservoirs), and that a pigpen on Severance Beach will not trouble the water at the Bog pumping-station (the place of intake of the other supply reservoir), or that a dead horse in the brook at Auburn village will not affect the taste of water in the Oak Hill reservoir," how far could the board of health of Manchester by their rules protect and preserve the purity of the water?

The statutes hereto recited might afford a remedy, but proceedings under the rules of the Manchester board of health in a legal prosecution would need the sympathy of the court or justice to give the desired relief, and then if the respondent was alive to his rights (as most violators of such rules are), they would have to stand the test of the supreme court at a trial term and perhaps the consideration of the full bench before definite conclusions were reached, making the settlement of the question tedious as to time, and expensive in money.

There are no sinners more difficult to deal with than those who sin just a little, and who in reality mean no harm. It is more difficult to convict a person violating the rules of the board of health or the ordinances of a city or town than it is

to convict a midnight burglar. The first is often and perhaps usually a "good fellow," and what he has done would not in itself work any great injury. He is eminently respectable, and on the whole a law abiding citizen. He believes he is just as good and has the interests of his fellow men as much at heart as the members of the board who made the rules. The rules were not made for him, "but for disreputable fellows" (and the rules are only what three men who appear to him to be cranks have made, and ought not to apply to him). "Why have these cranks made rules that no one shall bathe in the lake? What harm can there be for my boy or myself to take a dip on the Auburn shore? We don't go in to wash ourselves, but simply for recreation. Such rules ought not to apply to us, to respectable people, but to the filthy creatures, the tramps and vagabonds, who soak their filthy bodies but once a year. They should be imprisoned and punished."

With this feeling existing, local justices are timid in vigorously applying the penalties to their neighbors and friends. But the burglar perhaps endangers life and converts to his own use the property of a single individual, and when once found or suspected, every man's hand is against him. He attracts no admirers by his shrewdness and has no sympathizers on account of his misfortune. His gentlemanly behavior affords him no relief, and there is no leniency because he stole what could best be spared. There is no palliation of his crime and the entire public is anxious for vindication of the law. The statute law has been violated even if he did not succeed in obtaining the value of a single cent. He is punished for the intent to steal.

If the protection of property was left simply to rules that might be laid down or promulgated by a board of censors created as are our boards of health, the whole community would demand explicit statute laws for the protection of their goods and chattels, laws that it was the duty of every man to lend his aid to enforce. Why, then, should not certain, definite, and explicit laws, applicable to all reservoirs of water designed for the use of the public for domestic purposes, be placed on

our public statutes? It is true that the right of eminent domain has to a certain extent been conferred upon the water board of the city of Manchester, whereby the city may obtain ownership of land adjacent to the lake. The process, however, has not thus far met with great success, and it involves an expense of litigation both to the city and the landowner which ought not to be borne by either, and then the premises are only protected by rules and regulations of the local boards except so far as a trespass may be punished by suit. While this may be of value to Manchester, regulations regarding the use of the shores of any such water reservoirs for a certain distance from high water mark, enacted by the legislature of the state, would be of much greater utility than rules promulgated by the state or local boards of health, or by boards of water commissioners, which may prescribe different rules for the protection of one and the same reservoir. I believe we should have certain, well-defined general laws placed upon our statutes which every man is bound to know, and the ignorance of which furnishes no excuse for their violation. I would regulate by statute the distance from the high water mark of such reservoirs, that buildings should be erected or maintained, also grounds for the protection of the tributaries of such reservoirs, and provide for the removal of such buildings as might prove a source of danger to the water with, of course, suitable recompense to the owners.

Life may be cheap, but good health is dear to every one who lives. Let me be well while I live and have the strength and power to work till death shall place his iron hand upon my throat and say, "I want you now," and I will not complain. But spare me from a lingering disease and living death, the results of impurities in the necessities of life, from the work of insidious germs that sap the vitals and eat out the core of strength, and end in ghastly, hideous, lingering dissolution.

That fate is coming to human beings about us every day. How much of it is due to the impurities in food and drink we cannot tell, but what we know is harmful to the human system, that which must do harm to those who cannot help themselves;

that which will sap the constitution, breed fevers, pestilence, and death, let us have the strong arm of law enacted by the legislature of our state to crush out, fortify against, and prevent its doing its destroying work, and if forty years ago it was necessary to enact laws to give the people of our state pure rum, let us in these days have laws upon our statute book that shall insure to our wives, our children, and those whose good sense teaches them to shun "the cup filled with the liquid of the sunset red," the crystal water, pure and sweet from Nature's cleanly hand. To this end let state and local boards of health apply their earnest thought and work; let them meet and form such a code of laws as will protect each lake and stream that supplies a city, town, or village from impurity and contamination, and then let each local board see that their members of the legislature know the merits of the bill.

The legislature of our state is not lacking in a desire to protect the people from any and all danger, whether it be that of the armed foe in battle array or the insidious enemy that does its work unseen by the human eye, until the poison has done its awful and too often deadly work, and I believe it will gladly and expeditiously take this matter under consideration and enact such general laws as will in a measure give the desired relief.

SOME OBSERVATIONS ON BOVINE TUBERCULOSIS IN NEW HAMPSHIRE.*

By Irving A. Watson, A. M., M. D., president state board of cattle commissioners, secretary state board of health.

In order to show in part the experience and observations upon which some of the conclusions of this paper are based, a brief history of the official recognition of bovine tuberculosis in New Hampshire is necessary.

In 1891 the legislature enacted a law creating a state board of cattle commissioners, and also provided in the organic act that the secretary of the state board of agriculture, the master of the state grange of Patrons of Husbandry, and the secretary of the state board of health should, *ex officio*, constitute the board.

The act carried with it an annual appropriation of ten thousand dollars, and gave the board ample authority and power in every particular to take such action as it might deem best in its efforts to suppress the disease.

In the organization of the board the secretary of the state board of health was made president, and the secretary of the state board of agriculture secretary and executive officer, and as both of these were already salaried officers of the state, no draft has ever been made for salaries upon the annual appropriation of the cattle commission, except for the services of veterinary surgeons and for clerical work, so that the greater bulk of the appropriation has been available to pay indemnities for cattle destroyed.

* Read at the Twenty-Sixth Annual Meeting of the American Public Health Association, held at Ottawa, Canada, September 27-30, 1898.

During the first two years of the work of the board the outlay was small, for the reason that the law provided that all animals destroyed should be paid for at their value in the diseased state. As the board took the ground that a tuberculous animal was practically worthless, small awards were made, and for this reason it is probable that some cases were concealed which would have been brought to the notice of the board had the compensation to the owners been greater.

In 1893 the legislature amended the law by providing that all animals destroyed by order of the commission should be paid for at one half the value of the animal in health.

Among the rules adopted by the board was one requiring that all applications for the examination of animals should be made through the selectmen of the respective towns. The board also established a quarantine against cattle from Massachusetts, because it was the practice to send many herds from that state annually into New Hampshire for pasturage, and it was found that by far the greater prevalence of bovine tuberculosis was in that section of the state so used for pasturage. As a result of the quarantine regulations it was found that from 8,000 to 10,000 cattle were brought annually into the state from Massachusetts, and subsequent investigations of the board showed that very frequently tuberculous animals were disposed of for a few dollars in New Hampshire, and not taken back to Massachusetts, thus accounting for the large number of cases in that particular district. Later quarantine was enforced in all cases where animals were brought into the state.

The people of the state, through the publications of the state board of health, the state board of agriculture, the state grange, and addresses at agricultural and dairymen's associations, became comparatively well informed regarding this disease, as was shown by the fact that in 1895 the legislature of the state passed, almost unanimously, a bill appropriating $100,000 for the use of the state board of cattle commissioners, with which to begin a systematic examination of all the cattle in the state, and for the destruction of all those

found to be tuberculous; but the governor vetoed the bill. These facts are given in order to show how much interest has been taken in this work, and are the foundation of our belief that the cattle owners throughout the state, almost without exception, have asked for an investigation whenever they have suspected tuberculosis in their herds.

From the organization of the board, in 1891, to September 1 of the present year, the commissioners have examined 1,846 herds of cattle, the total number of which, although not recorded, represents many thousands of cattle. From this number 1,483 cattle were destroyed by order of the board, of which 296 were condemned upon the tuberculin test, and 1,187 upon physical examination. The tuberculin test has been applied to 1,362 cattle. It should be borne in mind that examinations have been made only in cases where the disease was suspected, and upon application therefor.

Fourteen hundred and eighty-three post mortems were made, or, in other words, every creature killed was examined. Of this number evidences of tuberculosis were found in 1,478, leaving only five cases in which the disease was not discovered.

The statement sometimes made that bovine tuberculosis may be eradicated is not borne out in practical dealings with the disease, or from any point of view, except the theoretical one that it would be possible under certain conditions to destroy all tuberculous germs. It is as well first as last to abandon the idea that tuberculosis in cattle will be eradicated, and direct our energies to reducing the disease to the lowest possible degree. In order to stamp out the disease entirely it would become necessary to destroy all tuberculous animals and persons, and to hold all others in strict quarantine until all the existing germs of the disease were destroyed.

Suppose it were possible in a single year to destroy every case of bovine tuberculosis and to disinfect every stable, how long would it be before re-infection would take place through tuberculous persons?

We believe that if the state would maintain sufficient supervision over its cattle to destroy all cases of tuberculosis that

could be detected by a careful and thorough physical examination by competent veterinary surgeons, the danger of infection from tuberculous meat and milk would be reduced practically to a minimum. This is a work, too, which would be practicable in every state and which could be carried on without extraordinary appropriations.

That this can be accomplished chiefly by a physical examination of the suspected animal, is a conclusion which we have arrived at almost wholly from our own experience. The first two or three years' work of the board was conducted entirely through physical examinations. Later we adopted tuberculin as a diagnostic agent in 1,362 cases, and 296 cattle were condemned on the evidence of the reaction from this agent. A very large per cent of these cattle, as shown by post mortem examinations, were in our judgment so slightly affected as not to be an element of danger to the community; while those that were so far diseased as to lead to the belief that they should be included in the really dangerous class, could have been diagnosed by physical examination. We, therefore, suspended the use of tuberculin, except possibly in an occasional case, for the purpose of corroborating a diagnosis already made.

As already stated, we believe that a majority of the cattle reacting to the tuberculin test are not diseased to an extent that requires their slaughter for the protection of the public health. This conclusion has been arrived at, not only by the cattle commissioners of New Hampshire, but also by Massachusetts and Connecticut, at least, of the New England states.

Massachusetts up to the present year had expended the enormous sum of $700,000 in the destruction of tuberculous animals in that state, condemned largely through the tuberculin test; but this policy has been entirely abandoned, and the position taken by New Hampshire is indorsed by Peters and other prominent authorities who were formerly strong advocates of the slaughter of all animals that reacted to tuberculin.

Under this test we have destroyed many animals in which only the slightest evidences of the disease could be discovered, as, for instance, a single gland in which the tubercular process

was barely discernible; in others, a single gland, or more, enlarged, filled with cheesy matter and already taking on calcification; and in still other cases, complete calcification or encystment had taken place.

It is a well known fact that tuberculin does not in the least reveal the degree of infection. Experience has also shown that it is not so reliable a test as was formerly supposed. Salmon admitted some five years ago* that while "tuberculin is a great aid in the diagnosis of tuberculosis, it is not infallible, and may lead to some errors."

Prof. James Law, than whom no man in this country has done more to encourage the use of tuberculin and to cause others to place implicit faith in it, has recently written a paper on "Tuberculosis in Cattle and Its Control," published as a bulletin from the Cornell University Agricultural Experiment Station, which is a remarkable modification of his former views in regard to this disease. In this paper he cites eleven conditions under which tuberculin as a diagnostic agent is unreliable. This admission shows how impossible it is to detect, by any known agent, every infected animal in a herd.

Professor Law admits that tuberculin has been objected to because it detects, under favorable conditions, even the slightest and most latent cases of tuberculosis, some of which would recover and many would remain useful for years; and, also, "if the latent cases are to be retained in the herd and the advanced cases only removed, then truly tuberculin should have no place in your system; physical examination should be all-sufficient for your purpose."

The paper itself is one from which an argument may be made almost as well in favor of as against the use of tuberculin, from whichever point of view one prefers to look at it. He cites examples of the successful extinction of tuberculosis in infected herds through physical examination and disinfection, sufficient to satisfy the most critical, the proof of which was in the final subjection of all the animals to the tuberculin test, with the result that not a single case was found, and this

* Transactions of the American Public Health Association, 1893.

in a herd of about two hundred head of cattle, 50 per cent of which had been condemned upon physical examination.

In our own experience we have found instances in which tuberculosis existed, although the animal did not react to tuberculin. As an illustration: On May 2, 1896, we were asked to examine a herd of cattle in the city of Rochester, upon a farm where, a few years previously, an entire herd of forty animals had been destroyed under the tuberculin test. The herd consisted of seventeen cattle, fifteen of them reacting to the tuberculin test; but the entire herd was destroyed, and the two that did not react were found to be tuberculous like the others. A sufficient number of experiences of this kind have occurred in our own work to show that this agent is by no means infallible.

As the most efficient means of preventing the spread of tuberculosis, the conclusion has been forced upon us that sanitation must rank first. Whenever we have found tuberculosis to exist extensively in a herd of considerable proportions, we have invariably found one of two conditions in connection therewith, to wit: That the animals were stabled in close quarters, with an entire absence of proper ventilation and cleanliness, thereby maintaining an atmosphere so warm that the temperature rarely reached the freezing point in mid-winter; moist and charged with the effete stable products, thereby creating the very best possible conditions for the tubercle bacillus and its diffusion among the animals. Or, second, a degree of in-breeding among some of the thoroughbred herds that in all probability impaired the powers of resistance and rendered these animals particularly susceptible to infection.

It is a very common occurrence to find stables constructed with a deliberate purpose to retain the animal heat, without any attention to ventilation or other sanitary conditions. Under such circumstances, once infection is introduced into the herd, even though the diseased animals are destroyed as soon as discovered, disinfection of the stables sufficient to destroy the germs is next to, if not quite, an impossibility. The remedy lies therefore, as far as this phase of the question is

concerned, in educating the farmer and stockraiser along these lines, and to show him that the best protection he can give his herd, not only against tuberculosis, but against other diseases from which cattle occasionally suffer, lies in sanitation.

Imagine what it means when we speak of disinfecting a stable constructed in this way with a cellar or basement, damp in itself, never exposed to the sun, into which all the excrementitious matter of the stable is deposited. Imagine such a stable thoroughly infected with a germ which we are told lives almost indefinitely under conditions of moisture associated with nitrogenous matter, the latter of which has accumulated everywhere in the stable, not to speak of the great masses of material gathered in the cellar. Disinfection under such conditions would be only partial at the best, and might or might not protect animals introduced into such a stable, even if not for two or three years afterward. The complete eradication of the tuberculous germ from an infected stable, except through absolute abandonment for a series of years, is very improbable, especially under unsanitary conditions.

On the other hand, we believe that if particular attention were given to the sanitary construction and care of stables, the danger from the spread of the disease in a given herd, even though a tuberculous animal were in it, would be relatively small. This premises a stable in which there is sufficient cubic space per creature, with ample ventilation, light, and dryness, all of which conditions are attainable in most localities. With stables kept in a thoroughly cleanly condition, frequently swept and washed, with the addition of some disinfectant and the segregation of animals discovered to be diseased, we believe the spread of tuberculosis would be practically nil.

It is in this connection that we wish to present some evidence corroborative of the assertion that the disease may be arrested, based upon an experiment made by the New Hampshire cattle commissioners during the present year.

June 12,1897, a herd of thoroughbred Holstein cattle were examined under the tuberculin test, twelve of them failing to

pass. Two of these were in an advanced stage of tuberculosis, and were destroyed. Of the remaining animals, one was a thoroughbred Holstein bull, weighing over two thousand pounds, and all were under four years of age. All these animals were tested with tuberculin September 12, December 9, February 23, and on May 9 those that were living on that date were again subjected to the test.

Five of the ten animals passed the test of September 12, and five, including the bull, failed to pass. Owing to the inconvenience of keeping the bull and the supposition on the part of a few people that he was badly diseased, he was killed soon after the test in September, although there was no indication of the disease upon physical examination. The post mortem revealed only the slightest evidences of tuberculosis.

The nine remaining animals were placed upon an isolated farm, where they were given proper sanitary care, including good ventilation, light, and moderate feed. They were kept in the open air day and night, except in stormy weather.

As a result of the test of December 9, only three of the animals reacted, and in one of these the disease was sufficiently developed to be detected by physical examination. These three animals were again tested on February 23, with no material change, and on March 29 were destroyed, the one condemned upon physical examination proving to be a well-developed case of tuberculosis. The other two killed at the same time exhibited no external evidences of the disease, and only the slightest traces were found upon a most thorough post mortem, the condition being such as to lead to the belief that the disease was not only being reduced, but was on the way to ultimate recovery.

The six remaining animals were tested with tuberculin February 23 and May 9, and each time passed the test successfully. Upon physical examination they appeared to be in perfect health, and a little later they were returned to the original owner, who was a cultured and wealthy business man, and who was perfectly satisfied with the result of the examination. The action of the board was, however, criticised in certain

quarters, undoubtedly for special and individual purposes, and we therefore determined to destroy the animals and make a careful post mortem examination, in order to determine whether or not our conclusions were correct. Accordingly in August they were killed, and an autopsy made in the presence of the commissioners, a competent veterinary surgeon, and several witnesses, with the following results:

A careful autopsy was made in each case. All the internal organs were searched for evidences of disease, which were found only as stated below:

No. 1. (3790) A small encysted mass, as large as a medium-sized walnut, was found near the apex of one lung. Two of the bronchial glands were somewhat enlarged and filled with caseous matter of a thick consistency. These were the only lesions found. No evidence of recent inflammatory action or pus. All the other organs were in a healthy condition.

No. 2. (52) Two of the bronchial glands were enlarged and filled with caseous matter. On a small portion of the left lung, adjacent to the fifth rib, were found granulations, probably miliary, and which also appeared in a small patch on the ribs contiguous to the granulations on the lung. No inflammatory condition existed, and no other evidence of disease was found.

No. 3. ( ) Bronchial lymphatics slightly enlarged and containing a small amount of cheesy material, apparently encysted. No other evidence of disease.

No. 4. (366) A small nodular, encysted mass, of the size of an ordinary marble, was found in the apex of one lung. No other evidence of disease.

No. 5. (363) In one of the bronchial glands was found a small mass of caseous matter, cylindrical in shape, about one eighth of an inch in diameter and more than an inch in length, partly calcified. No other evidence of disease.

No. 6. (362) In the upper part of one lung was found a caseous deposit, encysted, the size of a small walnut, with some calcification. In the lower part of the lung was an encysted nodule, about the size of a small cherry, containing caseous matter. No other evidence of disease.

In all the above-mentioned cases a careful examination was made of those organs most likely to be tuberculous, including lungs, liver, heart, stomach, bowels, kidneys, uterus, mammary glands, mesentery, lymphatic, and pigmentary glands,—in fact everything except the brain and spinal cord, which it was not deemed necessary to explore.

All the cows were in an excellent condition and probably would have passed through most, if not all, slaughtering houses without any disease being discovered, with perhaps the single exception of case No. 2, in which the granulations upon the lung, being upon the outer surface, were apparent upon the removal of that organ.

In not a single case was there any evidence of active tubercular progress; no inflammatory condition existed in any of the creatures, and no pus; neither was there any evidence of a breaking down or softening of the caseous matter of the glands. In other words, the general appearance was that of an arrested progress of a condition which at some prior time of infection had caused serious local trouble in the circumscribed localities mentioned. So excellent was the general condition of all the animals that it would have been absolutely impossible for a veterinary surgeon to discover by physical examination the least evidence of disease.

If the tubercular process was arrested, as appears to have been the case, we can see no reason why the cows might not have died of old age, had they not been slaughtered. Certainly if the tuberculous material had become encysted, as was found to be the case, and slow calcification was taking place, it is more than probable that no serious disturbance or further infection would have occurred from these practically isolated products and results of a former active morbid process. This would apply to all the cases and conditions found, with the exception of the one in which the granulations existed. Whether the cell proliferation had ceased, is a question which we are unable to answer, although the appearance of the granulation was of a limited and atrophied nature, rather than of an active growth.

A similar experiment was made in 1895-96 at the Maine Agricultural Experiment Station* with very similar results. A herd of ten cows and heifers that reacted to the tuberculin test were kept under observation, the last until October, 1897, each of them being subjected to frequent inoculations with tuberculin, and occasionally reacting.

Without giving a complete account of the treatment or a detailed report of the autopsies, it is sufficient to say that in five of the animals, or 50 per cent, the disease was held in check, so that it made practically no progress. In three others a little advancement was made, and in two cases the disease had nearly reached a fatal termination when the animals were killed.

Judging from the autopsy records, there seems to be no reason why the five animals in which the disease was arrested might not have continued in good health.

As may have been inferred from the tenor of this paper, we believe that the danger of infection from bovine tuberculosis has been greatly overrated. On this point our own views have undergone a somewhat radical change from those already on record, brought about by evidences which cannot be fully discussed at this time. We are convinced that whatever danger exists arises almost entirely, if not wholly, from those animals in which the disease is so far advanced that it may be detected by a competent veterinary surgeon upon physical examination, barring, possibly, the localized appearance of the disease in the udder, in which event the tuberculin test would determine the diagnosis.

It may be stated in this connection that the veterinary surgeons employed by us have become wonderfully expert in the physical diagnosis of tuberculosis after a little experience.

By what means those animals which we consider dangerous to the public are to be detected and destroyed, is a problem which will doubtless have to be settled differently in different sections. In our own state we believe that the dairymen and stockraisers have such a wholesome fear of their herds becoming infected that they report at once even a suspicion of the

* See Annual Report of the Station, 1897.

disease, and then such suspected cases are examined by the commission.

But we believe that this matter should not be left wholly to this method of detection, but that a law should be enacted providing for the registration of all dairymen—in fact, of every man who sells milk; that the state should be divided into districts and that an inspector be appointed for each district, who should make occasional inspections under the direction of the state board of cattle commissioners, report the condition of all herds examined, and give instructions to dairymen, by circulars and otherwise, on the necessity of maintaining sanitary conditions and how to do it. The registration fee should largely, if not wholly, meet the expenses of the district inspections. Also that slaughtered animals should be inspected before being sold. Under some such system as this we believe the disease could be reduced to very small proportions, and that, too, without extraordinary state appropriations.

In conclusion we present the following propositions:

1. That it is impossible to eradicate bovine tuberculosis; but that it may, without inflicting too great a burden upon the state, be reduced to a degree that will subserve the interests of the stockraisers and likewise protect the public health.

2. That but a very small percentage of the animals infected with tuberculosis in any way endanger the public health, and that an indiscriminate slaughter of the cattle reacting to the tuberculin test is wholly unnecessary, inasmuch as many of them either recover or the disease is permanently arrested.

3. That a proper sanitary condition of stables and stable inclosures would do more toward preventing the spread of bovine tuberculosis than any other measure that could be adopted.

4. That the danger of infection from bovine tuberculosis may be reduced to very small proportions, if not wholly eradicated, by sanitary measures, inspections, and physical examinations by the state, in co-operation with local authorities.

5. That such inspections, once inaugurated, could be maintained without an expense that would be burdensome to the state.

ALMSHOUSES.

BELKNAP COUNTY ALMSHOUSE.

This institution is located in the suburbs of Laconia, a little more than a mile from the railway station, and is well situated for an institution of this kind. It consists of an almshouse and county jail, with stables and an adjacent building, the upper portion of which is occupied by the chronic insane.

This institution has been materially improved during the past few years, and is now, with a few minor exceptions, suitable for the purposes of the county. The main house is in good condition, has an abundant supply of good water and is well heated. The old method of pumping water into large tanks in the attic of the main building by wind power is still maintained, although the institution is connected with the city water service, which gives good hydrant power; but as the water is metred to the almshouse, the maintenance of the old system is a large saving to the county in water rents. This plan necessitated the double piping of the house. Some of the old pipes are defective and should be replaced.

It is understood that the commissioners recommend that a boiler house be erected outside of the main building. Aside from the danger from fire, the present system is inconvenient by reason of the overheating of a portion of the house, especially in summer, as a fire is maintained constantly to produce steam for cooking purposes. We would recommend that such a house be erected in the near future, and that the county convention make an appropriation therefor.

The institution at the time of the summer inspection, August, 1898, contained a total of seventy inmates, including ten prisoners in the jail, nine insane persons confined in an outbuilding, and four young children.

The jail was in a fairly good condition, with the exception

that some repairs, which we understand have been provided for, were needed, for instance: two of the doors to the cells were defective, as was also one water-closet.

The jail contains fifteen cells and a bath room, with a water-closet in each cell. Some of the prisoners appear to take pride in keeping their cells in good order, while others were more or less careless in this respect; but on the whole the condition was very good.

The facilities provided for the care of that class of the insane which it is necessary to confine more or less are not what they should be. We called the attention of the county to this fact in the thirteenth annual report of this board, as follows:

"The building used for the insane is not a suitable one. For these patients ten rooms, including a bath room, were fitted up in the attic of a building occupied for the laundry and the woodshed. There are many objections to this plan, and we would suggest that the county take into consideration at the earliest practicable moment the need of erecting a new building for this class of patients."

There were confined in this place at the time of inspection four men and six women. It is but justice to the attendant to say that these quarters were found to be clean, more so than would be expected in such a place, and everything indicated the utmost attention and care of all details pertaining to cleanliness on the part of the man in charge.

The county should construct a new building for its insane, with separate wards for the two sexes. Such a building as the county needs would not be very expensive, and would not only provide better quarters for this class of inmates, but they could be cared for with much less labor. Connected with such a building should be an ample yard for those whose liberty is restricted.

In this connection we would also recommend an inclosed yard of ample size for the recreation of the females of the almshouse proper, among whom there are many who are irresponsible in almost every particular.

CARROLL COUNTY ALMSHOUSE.

Visited this institution October 21, 1897. Number of inmates, sixty. Number of insane, only one confined in the asylum, but there are nine who are considered to be demented, but during the day they are about with the other inmates. There are seven children in this institution, three of whom are under five years of age, and four between five and ten. Three of these children were born in the institution.

The inmates seem to be well cared for. The buildings are neat and clean, the floors of every room except the dining-room having a coat of paint. The building is heated by steam and has a good water supply, but no means of putting out fire except stand-pipes and hose within the building; no hydrants on the outside of the buildings.

The jail of Carroll county is connected with this institution, and within the last few years an entrance and exit has been made at that end of the building, so that in case of fire the inmates might be removed. There is no house of correction in Carroll county.

The dormitory for the men is a single room in the attic, which is well warmed and ventilated.

CHESHIRE COUNTY ALMSHOUSE AND ASYLUM.

This institution is located in Westmoreland, and, like two or three others in the state, is not very convenient to railroad facilities. However, as far as the location itself is concerned, the buildings are delightfully situated on the Connecticut river, and the farm is perhaps unsurpassed by that of any other institution in the state.

The buildings consist of the superintendent's house, a large almshouse, two asylum buildings, one for men and the other for women, and a work-house, besides barn, stables, and necessary out-buildings.

On the average there are about one hundred inmates, including prisoners and the insane. The main house, which is

built of brick, is ample for the pauper classes of the county, and is in a very excellent condition throughout.

The building for insane men, which was built several years ago, and which was described in a former report, at the time of inspection contained seven inmates, constantly confined, while some others who are more or less responsible, and able to labor, sleep there. This building is of brick, suitably divided into rooms, closets, bath room with hot and cold water, etc., and is in a good condition generally. About the time this building was erected, we expressed the opinion to the county commissioners that it would be entirely inadequate for the needs of the county. This prediction proved to be correct, and during the past two years the county has erected another building, for insane females, which is a model of its kind and which reflects great credit upon the county. This building was constructed of brick with granite trimmings, and is finished throughout with wood in its natural color; it is connected by a bridge with the other asylum building. There are twenty-eight rooms in this building, twelve on each floor and four in the attic, besides a large hall which is being finished in the attic for a chapel.

All the cooking for the institution is done in one general kitchen, but this new building has a sink, dish-closets, and closets for clothing, in which each patient has a compartment for her clothing and personal effects. There are water-closets and bath rooms on each floor; also on each floor one large room which answers for dining and sitting-room. In each room there is one bed and a radiator; the bedsteads are of iron, with good springs and mattress.

In the basement of the building is the laundry, the ironing room, etc. At the time of the inspection nineteen women occupied this building.

The building occupied by the prisoners contains six rooms on the first floor and two above. The building is well equipped and, like all the others of the institution, is heated by steam. In the basement of this building is the boiler for heating and cooking purposes.

The water supply has been somewhat short during the past year, owing to the failure of a dam. The difficulty has been remedied, and it is expected that there will be an abundance of water in the future. There are three outside hydrants, with an ample amount of hose and sufficient power to throw water over all the buildings. There are also five inside hydrants. The buildings are well painted and present a neat and clean appearance.

COOS COUNTY ALMSHOUSE.

This institution is located at West Stewartstown, within half a mile or less of the railway station. During the past few years this institution, like many others of the same character in the state, has been greatly improved throughout. The main building, which was originally a farmhouse, has been from time to time remodeled and repaired to the extent that it now constitutes a very comfortable almshouse for the county.

All the buildings are heated by steam, and the rooms were found to be neat and clean—in fact the general cleanliness of the buildings was all that could be asked. The floors and walls were in good condition, the latter being frequently painted or whitewashed.

The institution contained at the time of inspection seventy inmates, twenty-two of whom were classed as insane.

A few years since the county erected an additional building for the insane, connected with the main house by a long covered passageway. In the construction of this building due reference was given to the comfort of the occupants, the plans having been approved by the state board of health, and it may be said without contradiction that, relatively speaking, the accommodations provided by this county for its pauper insane are not excelled by any in the state. The halls are sufficiently large for general exercise, while the rooms are ample in size. The entire building is finished in hard wood, well heated by steam, and lighted by electricity, as is the entire institution, including stables and out-buildings.

GRAFTON COUNTY ALMSHOUSE.

This institution, located on the line of the Boston & Maine Railroad, about two miles from Woodsville, has a little station of its own, at which way trains stop. Within a year a side track has been put in, so that coal and other freight for the almshouse is now delivered directly to that institution, instead of being transported by team two miles, from Woodsville, as formerly.

At the time of this inspection the institution contained 103 inmates, twenty-four of them being classed as insane and occupying the wards for the insane.

The almshouse proper has been considerably improved during the past year, by the laying of hard wood floors, sheathing the walls of the halls, and the papering and whitewashing of rooms, so that at the present time the building presents a better appearance than ever before. The entire house was neat and clean in every part and reflected great credit upon the matron, Mrs. Phillips. Many of the inmates take care of their own rooms and take great pride in keeping them tidy and clean.

The inspector arrived unexpectedly at the almshouse a short time before supper was served, and thus had an opportunity to see the tables as they are laid daily, without any preparation for inspection, and it can be safely asserted that many a farmer in New Hampshire sits down to a table less abundantly supplied than that presented to the inmates of this institution. The cooking was first-class in every particular, and the quantity was ample. The commissioners stated that they had found it to be better economy, and more satisfactory in every way, to buy supplies of good quality only.

The buildings were found to be in a fairly good sanitary condition, and the water supply, which a few years ago was totally inadequate, is now abundant, with a pressure sufficient for fire purposes, as was fully demonstrated during the past year, when a fire broke out in the roof of the main building, and, although it had obtained considerable headway when

discovered, was readily extinguished with water from the hydrants.

The asylum for the insane contained twenty-four inmates; nine men and fifteen women. Some of the men are able to work on the farm, but most of the women are totally irresponsible, and have to be confined constantly in their rooms. This asylum has an unusually large percentage of exceedingly bad cases.

This institution has a modern watchman's clock, with ample stations, which keeps the watchman on active duty all night, as each station in the building must be rung in every hour, and from the stables every two hours, during the night. The latter service is perhaps more to ascertain if the cattle and horses are all right than for any other particular purpose, inasmuch as the farm has more than one hundred cows, and a dozen or fifteen horses, besides from one hundred to two hundred pigs and hogs. A large barn, with a basement under the whole of it, was built during the past year.

THE JAIL.

At the last session of the legislature the county convention appropriated $12,000 for the purpose of building a jail for Grafton county, to be located near the almshouse, so that both institutions might be under the management of one superintendent. The county commissioners were authorized to issue bonds for the purpose of obtaining funds to build the jail.

The building is now substantially completed. It is almost entirely of brick, and in the jail proper there is no wood whatever. It is two stories in height. The jail is entered by an ample hall, with stairway to the second story, and beyond the hall is a fair-sized room, suitable for an office or for a private room for the jailer. In the second story there is a hallway and a large room corresponding to the one below, which is designed for female prisoners, if such there should be, or, if not used for that purpose, it might serve as a hospital in case of illness among the prisoners.

From these two hallways the jail proper is entered, through

a solid steel door. There are two tiers of cells, one above the other. On each floor there are four cells and a bath room on a side, all of which are protected by a steel grating in front of the cells and at a distance of some three feet and a half, thus leaving a corridor for exercise, and to which even the worst class of criminals might be safely admitted, for if they should by any means get outside of this steel grating they would yet be secure by reason of the grated windows of the building.

The cells, which are of fair size with walls of plate steel, contain, each, two swinging frames for cots, a set washbowl, and a water-closet recessed in the rear wall, with a sliding door which secures it from observation when closed. The cells on the upper floor are constructed exactly the same as those below, with the exception that four of the cells above are built of Bessemer steel, and it is believed that from these the most adroit jail breaker could not escape. All the closets are automatically flushed and the institution has been carefully plumbed with the best fixtures. It is heated by steam, and the test of the past winter shows that the heating apparatus is ample for the building.

With two persons in a cell there are accommodations for thirty-two male prisoners. At the time of this inspection the jail, although completed, was not occupied.

The commissioners are to be congratulated upon having completed this jail at an expense of only about $10,000, and having paid for the same without issuing the bonds provided for by the county convention. Indeed, it may be said that the financial condition is most excellent, there being a debt of only about $8,000 now outstanding.

HILLSBOROUGH COUNTY ALMSHOUSE AND ASYLUM.

It is a pleasure to record the fact that since the last report on the Hillsborough county institution a great change for the better has taken place, inasmuch as the old buildings at Wilton have been abandoned, and new and commodious ones

HILLSBOROUGH COUNTY FARM BUILDINGS AT GRASMERE.

erected at Grasmere. Following is a brief description of this institution:

The administration building is situated in front, or south, of the almshouse, and is 49 x 38 feet, with L, and is occupied by the superintendent and his family and the officers of the institution. The building is three stories in front, with two-story L, and a cellar extending under all. In the cellar, or basement, are the fruit and vegetable cellar, milk room, butter-making department, boiler room, where is situated the heating apparatus, wash room for help, etc.

On the ground floor of this building are the parlor, sitting-room, dining-room, office, kitchen (where the cooking is done for this building), pantry, refrigerator, etc.

The second and third floors are divided into fifteen sleeping rooms, and such other apartments as would naturally be required in a building of this kind.

The almshouse is 230 feet in length, with wings 167 feet. The basement contains ironing room, dry house, smoking room, bath room, bakery, and flour room.

On the first floor, at the right of the main entrance, are the reception room for women, sleeping rooms for women, eleven in number, dormitory, sitting-room for old ladies, clothing room, nursery, etc. On the left of the main entrance are the reception room for men, the same number of sleeping rooms for men, dormitories, chapel, toilet rooms, and in the back part of the middle wing are the dining-room and the kitchen where all the food used in the building is cooked.

The second floor, on the women's side, is used for sewing room, toilet room, dormitory, hospital, and stockroom, where the new clothing is kept. On the men's side is the school-room, the toilet rooms, dormitory, and hospital, and also two large sleeping rooms for officers. This building will accommodate three hundred persons.

BUILDING FOR THE INSANE.

The basement of this building is used for a recreation room, bath rooms, and for general purposes.

On the first floor of this building are situated the dining-rooms for the insane, serving room, sleeping rooms, toilet rooms and attendants' rooms on the women's side, while on the men's side are like rooms, except that there is no serving room. On the second floor are the sleeping rooms of each department respectively. This building will accommodate one hundred and seventy-five persons.

PRISON BUILDING.

In the basement of this building are the toilet room, smoking room, bath room, and stockroom.

The first floor contains the dining-room for men and one for the women, a dormitory for men and another for women, and two sleeping rooms for officers. On the second floor are sleeping rooms for prisoners of each department, respectively, three rooms for men and one for women.

This building will accommodate eighty men and forty women.

All the buildings are heated from the boiler room, in the west end of the laundry, which stands north of the almshouse and near to the railroad.

The buildings are heated by what is known as the Sturtevant system, also steam heat through coils. The dining and bath rooms and all other necessary places are supplied with hot and cold water.

Each building has stand-pipes and hose enough attached to each to reach to any part of the building, delivering a stream of water with a pressure of eighty pounds to the square inch. The stairways and passageways are of sufficient width to afford ample means of egress.

The buildings are lighted by electricity.

There are yards for both the men and the women connected with the almshouse and the building for the insane; also yards for the children, in which are shade or summer houses, where all have a chance in the open air.

The bedsteads are of iron, with plenty of clean clothing and a spread on each bed. In the hospital department, as also for the aged and infirm, are spring beds or wire springs.

Religious services are held on the second and fourth Sundays of each month. There is a well equipped library of reading matter, and to a certain extent newspapers are supplied to the paupers.

The out-buildings consist of stock, horsebarns, piggery, slaughter-house, blacksmith shop, carpenter shop, meat room and refrigerator, undertaker's room, and all such buildings as are necessary, all of which, together with the large buildings of the institution, are protected against fire by seven three-nozzle post hydrants with a pressure of eighty pounds per square inch, gravity, and in addition are directly connected with the steam pump.

The institution has an excellent supply of pure water, and all departments and rooms requiring it are connected with the sewer and are well trapped and of sufficient fall to keep clear running to the valley of the river below. The sanitary arrangements seem to be excellent.

A general view of the institution is given in the accompanying picture.

There are at this institution during the summer months about four hundred inmates, and in winter about six hundred and fifty. At the time of the summer inspection there were included in the above forty-seven prisoners and one hundred and twenty-five insane persons.

STRAFFORD COUNTY ALMSHOUSE.

This institution within the past few years has been greatly improved in many particulars. It has now a good system of sewerage, an abundance of good water, a practically new system of steam heating, hot and cold water for use at all times, and apparently excellent protection against fire. There is stored at all times some 120,000 gallons of water, from which several good streams can be played upon the buildings simultaneously. There are over 1,000 feet of hose, and the engine connected with the pumps is at all times practically ready for use, as a fire is kept constantly under the

boilers, so that at any time, day or night, a good hose pressure could be obtained within four or five minutes.

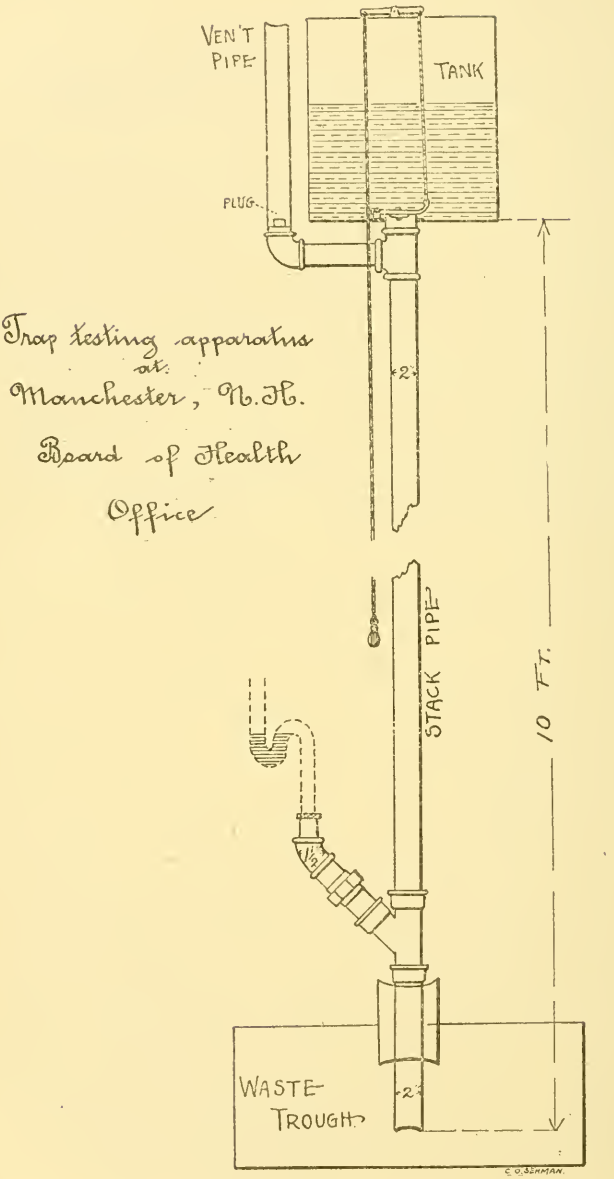
This institution has been equipped with an electric light plant, comprising an eight-horse power automatic engine, with dynamo of sufficient power to maintain 250 lights, 80 voltage. By this means all the buildings, including stables and outhouses, are lighted by electricity, so that not a lantern is used about the premises. It would seem that the danger from fire has been reduced to such an extent that the liability in this direction is very small. It may be mentioned also that the laundry has been greatly improved during the past year.

There are a few wants yet to be supplied, as is almost always the case in an institution of this kind. At the present time the greatest demand seems to be for increased hospital facilities. The quarters now occupied as a hospital are too limited and cramped, and some means should be provided to enlarge this important adjunct to the institution.

TRAPS AND TRAP SIPHONAGE.

By William K. Robbins and Carl O. Seaman, of the city health department, Manchester, N. H.

The plumbing trap is a device attached to the drainage fixtures to prevent sewer gas from entering the house, and usually consists of either a bend or small reservoir in the drain pipe, so arranged as to return a portion of the passing water, sufficient to close the pipe and form a seal, which will prevent the passage of gas, and which will remain continuously. The constancy of this water seal is the great desideratum. On long standing without replenishment by use of the fixture, the water evaporates, and by mechanical means the water is thrown out. This is usually called siphonage, and occurs in two ways: first, when the pipe from the fixture is completely filled by the discharging water and forms the longer leg of a siphon, so that when the water is exhausted from the fixture this weight of water in the pipe draws in a current of air after it sufficiently strong to remove the water from the trap so completely that not enough is left to form a seal; second, where the fixture is not in use, the discharge of contents of another fixture, which flows through the same main drain, and in passing produces a partial vacuum in the entering branches, on the principle of a Sprengle air pump, and to relieve the vacuum air rushes in through the trap and tends to drive the water before it, and thus break the seal. To prevent the breaking of the seal by either of these forms of siphonage, various devices have been applied to admit air without passing through the trap, which will relieve the partial vacuum in the drain. The most common and effective way is by what is called "back venting"; that is, connecting a small open pipe to the sewer side of the trap, which is carried up open to the roof of the building or to connection with



Trap testing apparatus at Manchester, N.H. Board of Health Office

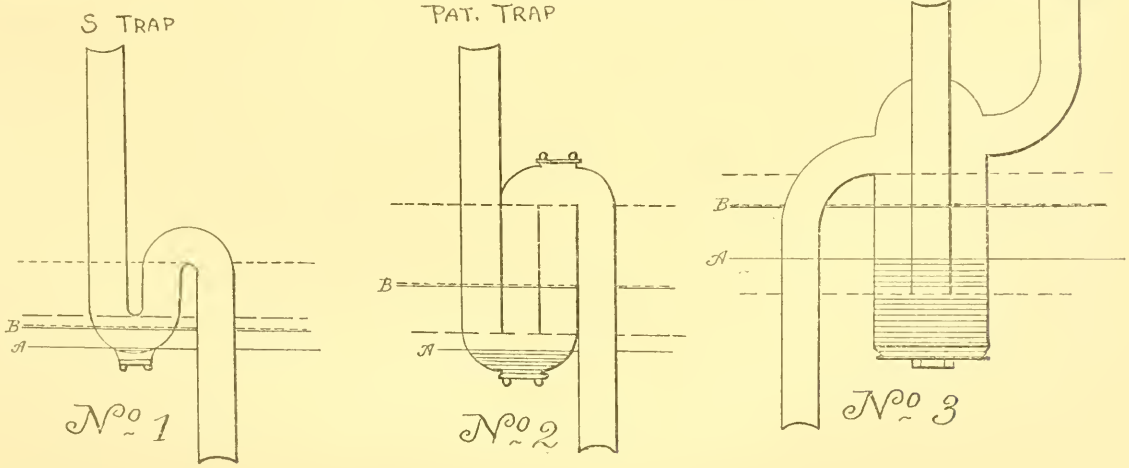
..... Line where water came to when trap was full.

A——— " " " " " " tested for siphonage, (vent pipe closed.)

– – – – " trap has lost its seal.

▒▒▒ Water.

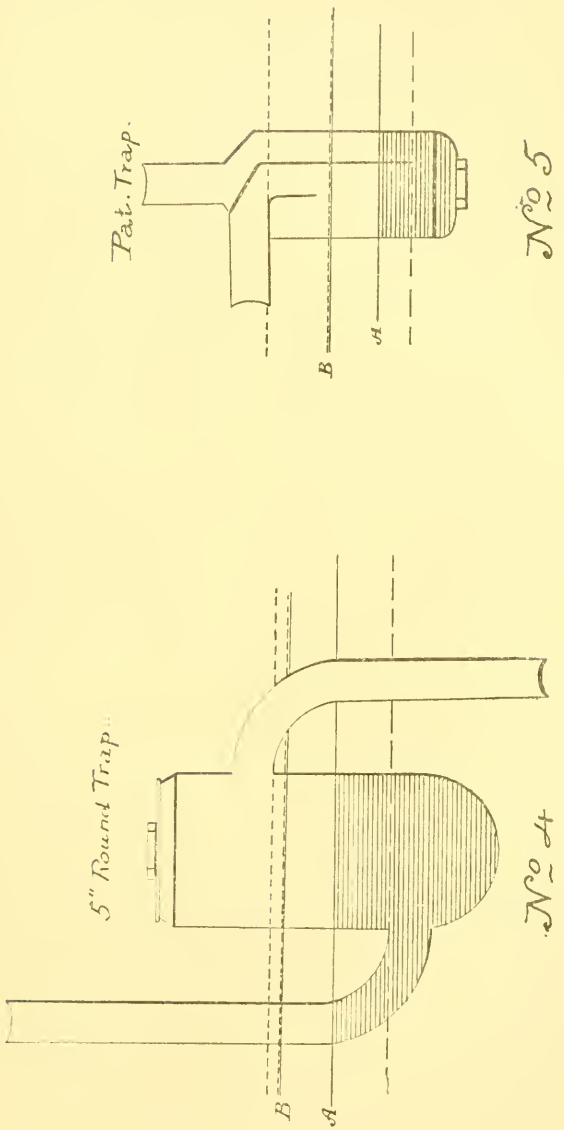
B——— Line where water came to when tested for siphonage (vent pipe open).



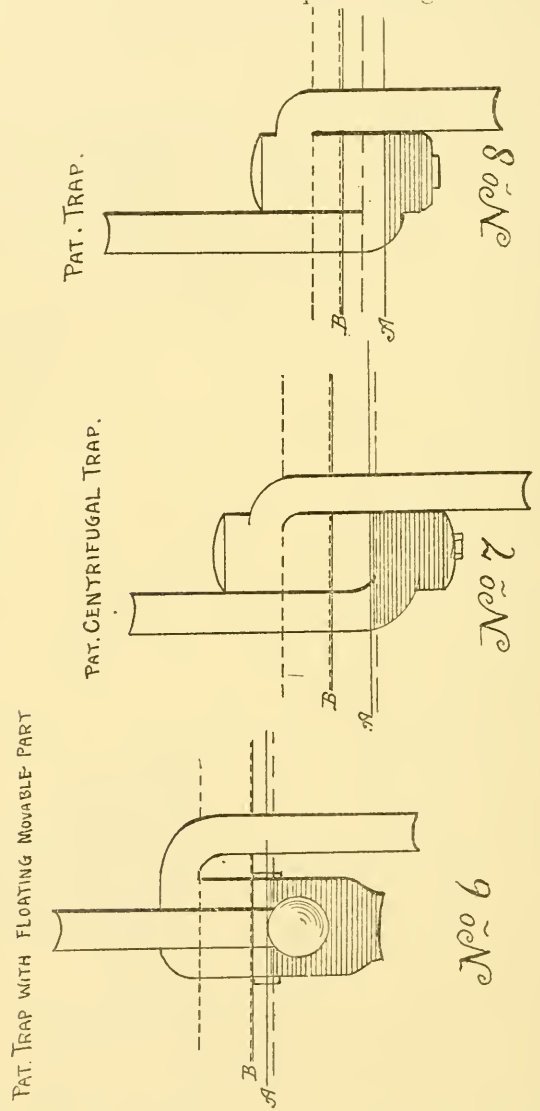
a main soil-pipe which extends through the roof. In this we have to deal with other than the principles of hydrostatic pressure, and the flow of gases and liquids through pipes.

We must take into account the force of impact, the weight and non-elasticity of water, and the lightness and extremely elastic property of gases. When these are considered we can understand how it happens that water descending through a pipe produces a partial vacuum behind it, even though the pipe be entirely open, as the water is so heavy that it descends faster than the light, elastic air will follow it. This will enable us to explain the rather paradoxical fact that an S trap may be completely siphoned when fully back-vented.

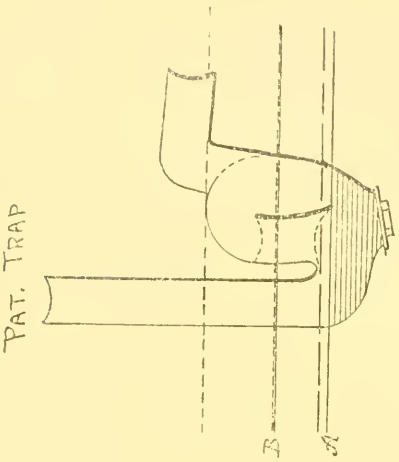
In administering the plumbing regulations of the city of Manchester, the Board of Health receives a variety of claims as to the value of different traps upon the market, with requests, of course, that a specified trap shall be recommended by the board, or that modifications of the regulations be made so as to favor this one or another, and of course promote the sale of it. It therefore becomes interesting to know something of the merits of the various traps. Little has been published in this line, and that little is the result of work done to make a showing favorable to some particular trap or device. An impartial trial upon the merits of traps could not be found, and the board requested the plumbing inspector to install at the office a device for obtaining such information first-hand. In accordance with these instructions, an apparatus was set up which, while not entirely new or original with us, we think serves fairly well the purpose of representing, on a small scale, the trials which traps may have to stand in actual use. A collection of most of the traps on the market was obtained, and provided with windows so that the contents of the traps can be observed at will. These windows are so made as not to influence the flow of water or gas, either to promote or retard it. The traps are numbered and the names omitted, as we are trying to ascertain merit and not advertise any trap or device. The apparatus consists of an elevated tank with a capacity of fifteen gallons, provided with


Pat. Trap.
B
A
No 5
5" Round Trap.
B
A
No 4

a two-inch discharge pipe and a clapper valve, sufficiently large to permit an immediate and complete filling of the two-inch



soil-pipe, which discharges into an open trough ten feet below. This stack-pipe is provided with a Y eight feet below the



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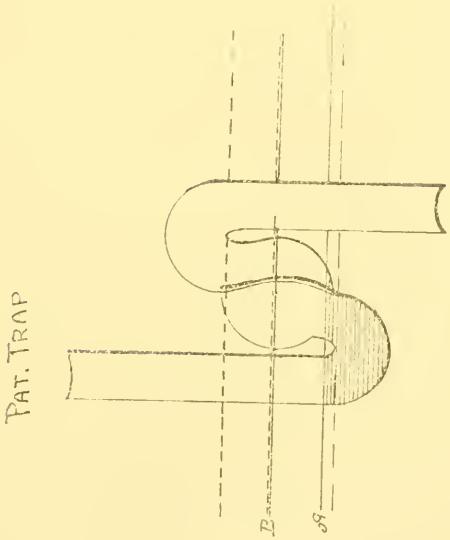


No. 9

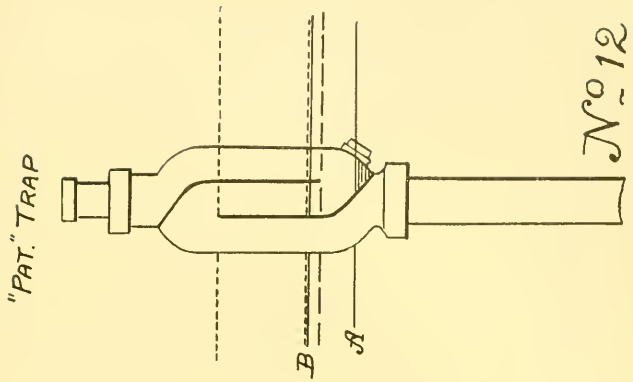
valve, and to this Y the traps to be tested are attached. This stack is also provided with a Y at the top beside the tank, which may be plugged or left open, so as to represent at will the old-fashioned, unventilated system of closed pipes, or the modern form of ventilation. To make the test, the trap is attached to the Y and filled with water. The valve is then opened until the stack is filled for a portion of its length, when the valve is suddenly closed, the descending column of water producing a partial vacuum, which tends to siphon the trap. With the plug in the top end of the stack, ten of such fractional discharges were made with a single tankful of water on each trap, and gave the following results, shown in diagram No. 1 and in the cuts of the traps.

This series of tests represents fairly well the severity of strain upon traps, experienced in the old, non-ventilated system of plumbing, especially where the plunger closets are in use. The number of fractional discharges is of little importance, since the first discharge takes the bulk of the water out of the trap, subsequent discharges taking but little additional and with some not an appreciable amount.

It will be observed that six of the twelve traps lost the seal entirely, while with three more the seal left did not exceed one fourth inch, which is a small factor of safety against even evaporation.

Another series of tests was made with plug removed from top of the stack, representing very nearly the conditions existing in plumbing, when the open soil-pipe extends through the roof, and fixtures are located one above another without back-venting the traps. The entire tankful of water was discharged continuously. The results are shown in diagram No. 2, and the depth of water remaining in the traps is indicated by a solid dotted line, ...

It will be observed that two traps lost their seal entirely, and in three others it is reduced to the danger line. The general conclusion to be drawn from these tests is that with the non-ventilated system of plumbing but very few traps are safe against siphonage, and these not certainly so, since they



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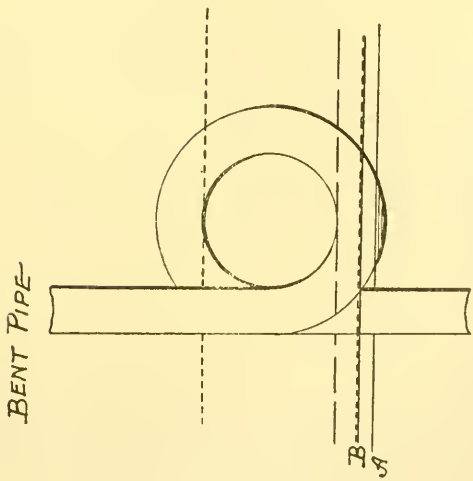
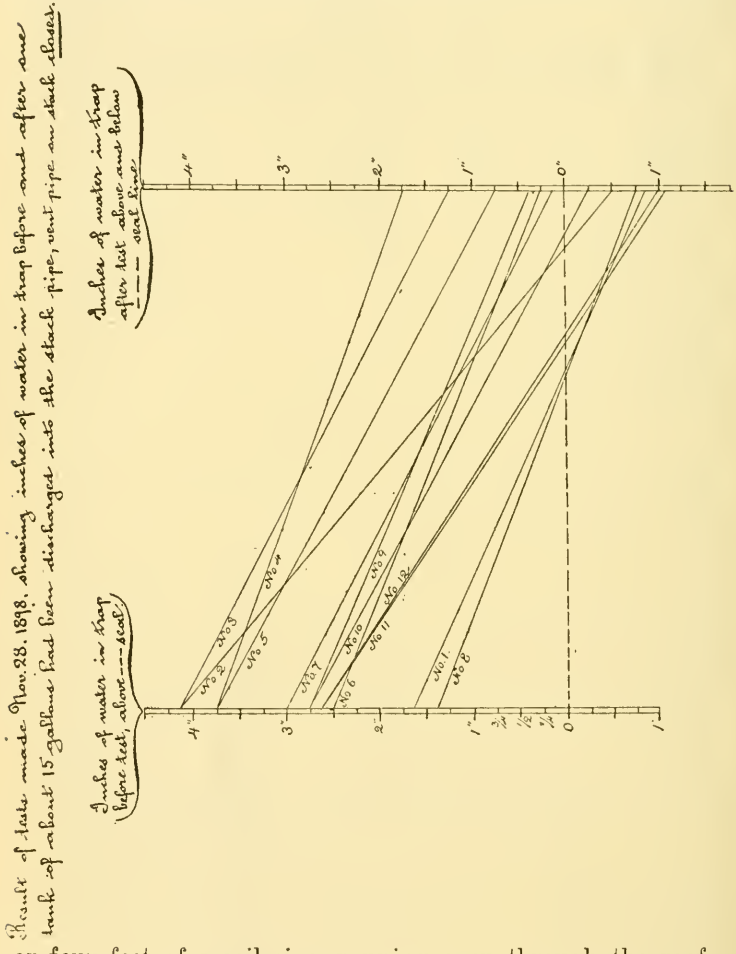


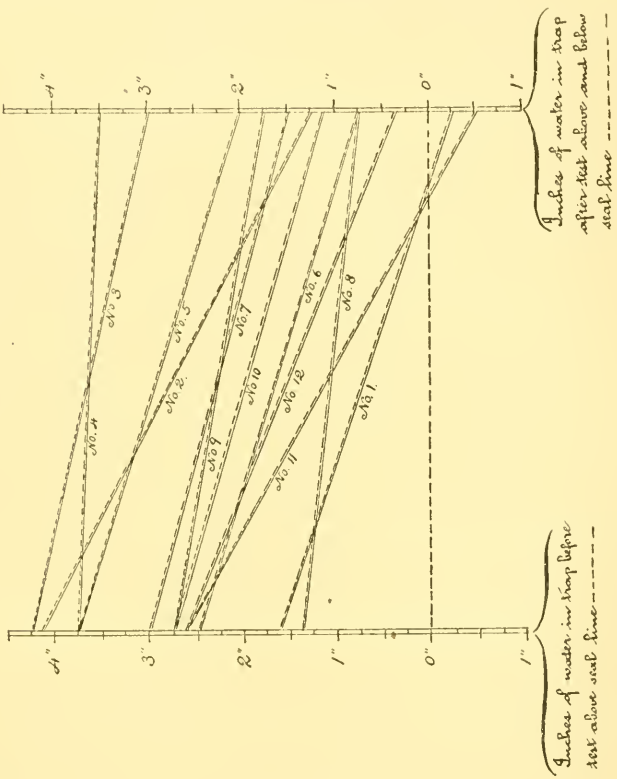
No. 11

scour so poorly that by long use they are apt to fill up, and be in effect S traps, which it is plain are not safe without back-venting in any system of plumbing. On the other hand, with the open or ventilated system, most of the traps are perfectly safe without back-venting, when located within three



or four feet of a soil-pipe, running open through the roof. This refers to cottages and ordinary dwellings, but in business blocks of many stories the extremely long pipes will approach too nearly the closed system on account of the elasticity of the

air, and all traps should be well back-vented to be perfectly safe. Therefore, no special trap is ever recommended, the trap being chosen to suit the location and requirements, and



must always be provided with a clean-out below the water seal, or on the house side of trap. Back-venting is required when in the judgment of the plumbing inspector it is necessary, and all goes to demonstrate that in all cities the business of plumbing should be under legal regulations, both as a means of fair competition among the plumbers and as a protection to the public health.

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Hon. CARROLL DAVIDSON WRIGHT,

United States Commissioner of Labor.

SECOND BIENNIAL REPORT

OF THE

BUREAU OF LABOR

OF THE

STATE OF NEW HAMPSHIRE

VOLUME IV.

MANCHESTER
ARTHUR E. CLARKE, PUBLIC PRINTER
1898

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EDWIN G. EASTMAN, *Attorney-General.*
CHARLES B. HIBBARD, *Law Reporter.*

LETTER OF TRANSMITTAL.

BUREAU OF LABOR (office in State House),

CONCORD, Sept. 1, 1898.

TO HIS EXCELLENCY THE GOVERNOR:

Sir,—I have the honor to submit herewith the second biennial report of the Commissioner of Labor.

This bureau has published two annual reports, Vol. I. and Vol. II., also one biennial report, Vol. III., which reports contain results of the more extensive investigations carried on by the bureau, also special studies of economics and social questions. This second biennial report, Vol. IV., contains brief results of original inquiries, together with condensations of foreign and domestic official statistics, current labor laws of New Hampshire, and decisions of courts concerning laws relating to labor.

In submitting this report, I desire to acknowledge the continued valuable service of Mr. Hosea B. Carter, my deputy, who has been chief clerk and statistical expert in charge of tabulations of the bureau from its organization.

I am very respectfully your obedient servant,

JULIAN E. TRASK,

Commissioner.

INTRODUCTORY.

The main features of this second biennial report, Vol. IV., 1897-98, will show by comparative tabulation the chief industries of our state, reported to this bureau for 1897, as compared with the average of such industries reporting for the years 1893, '94, '95, and '96, showing capital invested, material used, wages paid, value of product, employees, male and female, and number of days establishments were in operation.

The bureau has encountered the same difficulties in the prosecution of its work during the past year as during previous years, because of the limited means at hand. "While it is true that reports made to this bureau are voluntary, there being no legislation compelling manufacturers and managers to make them, it is to be regretted that any establishments fail to comply with the requests of the commissioner for information which might be of great value to themselves, and of interest to all our citizens. The spirit of the law, if not the letter, calls for a liberal response to the inquiries made."

There are in New Hampshire those who do not agree with Thomas Jefferson when he says that the greatest function of the government is to see that one citizen does not impose on his weaker neighbor, but those who do agree with him, and regard him as an authority, will readily understand the importance of the work of this bureau.

All agree that if a man is rich, well-connected, or has much political influence, it is the sacred duty of the state to see that he is not imposed upon by anybody; but to help those who need it most, to do anything for the amelioration of the humblest citizen, is at once "interfering with private business."

It should be understood clearly that the state has not only the right, but it is her duty to protect her citizens, not only from the employer's greed for gain, but also from the encroachment of the silver-tongued organizer whose prime motive is the creation and collection of weekly, monthly, or annual dues.

Employers combine to control the volume of output, and it may be called business; employees combine to put bread in the mouths of their

dear ones, and to lessen the hours of labor, and they are viewed with suspicion or distrust.

This bureau has done much good in a quiet way. Its mission is to allay friction, and by turning on the light, prevent the creeping in of injustice and wrongs.

The stringency of the times has caused many mills to shut down partially, thereby causing great loss of wages to employees. Many employers have run their mills (when it was in their interest to shut down) to give employment and to keep their people from scattering; many have built churches and schoolhouses at their factories, and added to school funds to lengthen the school term; and what is a pleasing feature about it all is, they do not consider it a charity or pose as alms-givers, but they do it from a sense of duty, and as one firm remarked, "because it was a good investment."

COMPARATIVE STATISTICS

1897-1898.

MANUFACTURES.

COMPARATIVE PROGRESSION OF MANUFACTURES.

The diversified interests of manufacturing industries of New Hampshire are such as require the best thought as to the method by which satisfactory and correct information may be obtained. While all reports of manufacturing establishments have been carefully scrutinized, and everything eliminated from the aggregate of wages paid except what was paid for wages only, and every effort made to ascertain what would be the average number employed during 1893, '94, '95, and '96, yet there remains that degree of uncertainty as to the average number of persons employed which the student of economics would wish removed, but which can never be entirely eliminated from the average method so long as there are many and frequent changes in employment, and there continue to exist irregularities in the operations of the various industries, coupled with innocuous reluctancy of wage-workers and employers alike.

Absolute correctness can only be arrived at by following the individual wage-earner through the time-books and pay rolls, giving credit for all earnings, whatever they may be, or in whatever capacity earned. In this way the result is not what a supposed individual earns, but is what an actual employee really does earn.

To reach this desired result, the co-operation of the manufacturer or employer is necessary, and while the bureau has met with very few refusals to furnish information required, yet, access to time-books and pay rolls is by many deemed to be somewhat of an inquisitorial nature, and a preference expressed for giving information more general in its character.

It should, however, be understood in making comparisons that the tables published herewith do not cover the entire number of industries or establishments in New Hampshire, but simply a compilation of statistics from reports made to this bureau by leading industries of our state.

COMPARATIVE STATISTICS.

Average of 1893, '94, '95, and '96, compared with 1897.

No.	INDUSTRIES.	Capital invested.	Cost of material.
5	BOOTS AND SHOES.		
	Reported for year 1897	$3,529,961	$6,711,398
	Average for years 1893, '94, '95, '96	2,320,118	3,563,547
	Increase shown, 1897	1,209,843	3,147,851
	Decrease shown, 1897		
6	BOXES OF WOOD OR PAPER.		
	Reported for 1897	176,500	178,326
	Average for 1893, '94, '95, '96	121,480	105,423
	Increase shown, 1897	55,020	72,903
	Decrease shown, 1897		
7	BRICK AND TILE.		
	Reported for 1897	240,000	39,896
	Average for 1893, '94, '95, '96	198,595	66,104
	Increase shown, 1897	41,405	
	Decrease shown, 1897		26,208
9	BUILDING AND CONTRACTING.		
	Reported for 1897	125,000	118,700
	Average for 1893, '94, '95, '96	77,900	137,946
	Increase shown, 1897	47,100	
	Decrease shown, 1897		19,246
11	CARRIAGES AND WAGONS.		
	Reported for 1897	121,000	43,346
	Average for 1893, '94, '95, '96	129,900	42,965
	Increase shown, 1897		381
	Decrease shown, 1897	8,900	
15	CLOTHING.		
	Reported for 1897	337,800	452,683
	Average for 1893, '94, '95, '96	281,900	277,268
	Increase shown, 1897	55,900	175,415
	Decrease shown, 1897		
16	COOKING AND HEATING APPARATUS.		
	Reported for 1897	181,320	203,748
	Average for 1893, '94, '95, '96	149,500	202,041
	Increase shown, 1897	31,820	1,707
	Decrease shown, 1897		
18	COTTON GOODS.		
	Reported for 1897	13,147,207	7,546,550
	Average for 1893, '94, '95, '96	6,915,322	3,650,221
	Increase shown, 1897	6,231,885	3,896,329
	Decrease shown, 1897		
19	COTTON MIXED TEXTILES.		
	Reported for 1897	870,000	712,749
	Average for 1893, '94, '95, '96	363,800	336,794
	Increase shown, 1897	506,200	375,945
	Decrease shown, 1897		
29	FOOD PREPARATIONS.		
	Reported for 1897	231,444	460,967
	Average for 1893, '94, '95, '96	274,124	296,158
	Increase shown, 1897		164,809
	Decrease shown, 1897	42,680	

COMPARATIVE STATISTICS.

Average of 1893, '94, '95, and '96, compared with 1897.

Value of product.	Total wages paid.	Employees.			Days run.
		Males.	Females.	Total.	
$10,288,431	$2,772,046	4,395	1,919	6,314	285
6,229,579	1,629,162	2,852	1,173	4,025	282
4,058,852	1,142,884	1,543	1,746	289	3
290,765	86,390	176	67	243	290
232,775	72,256	131	87	218	301
57,990	14,134	45	.....	25	.....
.....	.....	.....	20	.....	11
120,800	61,791	252	2	254	130
178,089	95,557	329	1	330	241
.....	.....	.....	1	.....	.....
57,289	33,557	77	.....	76	111
332,500	167,907	302	.....	302	300
327,145	87,919	197	.....	197	181
5,355	79,988	105	.....	105	119
92,680	34,338	81	.....	81	297
117,055	41,909	92	.....	92	286
.....	.....	.....	.....	.....	11
24,375	7,571	11	.....	11	.....
709,800	169,025	183	403	586	299
557,697	173,555	229	401	630	296
152,103	.....	.....	2	.....	3
.....	4,530	46	.....	44	.....
306,149	61,447	132	1	133	331
310,211	53,942	121	.....	121	306
.....	7,555	11	1	12	24
4,062	.....	.....	.....	.....	.....
15,677,296	3,208 176	5 188	7,162	12,350	276
6,031,380	1,565,362	2,373	2,925	5,298	291
9,645,916	1,642,814	2,815	4,237	7,052	.....
.....	.....	.....	.....	.....	15
1,033,457	289,403	523	361	884	294
505,971	118,081	187	124	311	269
527,486	171,322	336	237	573	25
614,803	73,772	181	24	205	300
608,736	70,485	141	16	157	303
6,067	3,287	40	8	48	.....
.....	.....	.....	.....	.....	3

COMPARATIVE STATISTICS.

Average of 1893, '94, '95, and '96, compared with 1897.

No.	INDUSTRIES.	Capital invested.	Cost of material.
30	FURNITURE.		
	Reported for 1897	$440,000	$230,247
	Average for 1893, '94, '95, '96	372,777	236,956
	Increase shown, 1897	67,223	
	Decrease shown, 1897		6,709
34	HOSIERY.		
	Reported for 1897	1,425,500	978,028
	Average for 1893, '94, '95, '96	1,336,096	828,631
	Increase shown, 1897	89,404	149,397
	Decrease shown, 1897		
37	LEATHER AND LEATHER GOODS.		
	Reported for 1897	520,000	292,920
	Average for 1893, '94, '95, '96	730,870	500,317
	Increase shown, 1897		
	Decrease shown, 1897	210,870	207,397
40	LUMBER MILLS.		
	Reported for 1897	3,995,900	1,444,433
	Average for 1893, '94, '95, '96	1,321,846	576,161
	Increase shown, 1897	2,674,054	868,272
	Decrease shown, 1897		
41	MACHINES AND MACHINERY.		
	Reported for 1897	876,100	411,909
	Average for 1893, '94, '95, '96	757,960	432,962
	Increase shown, 1897	18,140	
	Decrease shown, 1897		21,053
42	METALLIC GOODS.		
	Reported for 1897	665,300	268,081
	Average for 1893, '94, '95, '96	741,221	232,626
	Increase shown, 1897		35,455
	Decrease shown, 1897	75,920	
46	OILS AND ILLUMINATING FLUIDS.		
	Reported for 1897	1,015,059	35,735
	Average for 1893, '94, '95, '96	770,323	88,800
	Increase shown, 1897	244,736	
	Decrease shown, 1897		53,065
48	PAPER AND PAPER GOODS.		
	Reported for 1897	867,379	557,198
	Average for 1893, '94, '95, '96	293,854	247,803
	Increase shown, 1897	573,525	309,395
	Decrease shown, 1897		
52	PRINTING AND PUBLISHING.		
	Reported for 1897	144,059	42,812
	Average for 1893, '94, '95, '96	182,131	67,959
	Increase shown, 1897		
	Decrease shown, 1897	38,081	25,147
58	STONE AND STONE PRODUCTS.		
	Reported for 1897	677,000	102,159
	Average for 1893, '94, '95, '96	355,665	82,483
	Increase shown, 1897	321,335	19,676
	Decrease shown, 1897		

COMPARATIVE STATISTICS.

Average of 1893, '94, '95, and '96, compared with 1897.

Value of product.	Total wages paid.	Employees.			Days run.
		Males.	Females.	Total.	
$452,699	$158,897	356	14	370	285
501,126	156,435	507	14	521	271
.....	2,462	.....	.....	.....	14
48,427	.....	151	.....	151	.....
1,844,203	530,277	794	1,305	2,099	274
1,534,683	458,037	663	1,065	1,728	258
309,520	72,240	131	240	371	16
.....	.....	.....	.....	.....	.....
427,163	58,892	134	.....	134	293
772,966	160,605	1,500	10	310	268
.....	.....	.....	.....	.....	25
345,803	101,713	1,366	10	176	.....
2,564,186	874,148	2,468	22	2,490	242
1,016,478	296,144	873	4	877	225
1,547,708	578,004	1,595	18	1,613	17
.....	.....	.....	.....	.....	.....
977,611	397,613	841	.....	841	302
938,068	348,229	786	73	859	302
41,533	49,384	55	.....	.....	.....
.....	.....	.....	73	.....	.....
394,508	107,099	243	4	247	289
452,518	141,484	303	5	308	269
.....	.....	.....	.....	.....	20
58,010	34,385	60	1	62	.....
55,378	11,378	24	.....	24	365
235,067	27,324	59	.....	59	330
.....	.....	.....	.....	.....	35
179,067	15,946	35	.....	35	.....
822,020	139,706	354	33	387	276
830,348	47,699	99	30	129	276
91,672	92,007	255	3	258	.....
.....	.....	.....	.....	.....	.....
142,425	63,878	109	33	142	299
174,984	75,320	124	49	173	303
.....	.....	.....	.....	.....	.....
32,559	11,442	15	16	31	4
483,116	306,859	721	9	733	251
407,271	234,192	385	11	396	277
75,845	72,667	339	.....	337	.....
.....	.....	.....	2	.....	26

COMPARATIVE STATISTICS.

Average of 1893, '94, '95, and '96, compared with 1897.

No.	INDUSTRIES.	Capital invested.	Cost of material.
61	TOBACCO AND CIGARS.		
	Reported for 1897	$79,500	$192,091
	Average for 1893, '94, '95, '96	78,400	183,601
	Increase shown, 1897	1,100	8,490
	Decrease shown, 1897		
65	WOODEN GOODS.		
	Reported for 1897	1,298,237	642,844
	Average for 1893, '94, '95, '96	914,147	489,330
	Increase shown, 1897	384,090	153,514
	Decrease shown, 1897		
66	WOOLEN GOODS.		
	Reported for 1897	2,591,500	2,538,840
	Average for 1893, '94, '95, '96	1,132,400	1,172,911
	Increase shown, 1897	1,459,100	1,365,829
	Decrease shown, 1897		
68	MISCELLANEOUS.		
	Reported for 1897	867,150	697,496
	Average for 1893, '94, '95, '96	731,112	634,181
	Increase shown, 1897	136,038	63,315
	Decrease shown, 1897		

COMPARATIVE STATISTICS.

Average of 1893, '94, '95, and '96, compared with 1897.

Value of product.	Total wages paid.	Employees.			Days run.
		Males.	Females.	Total.	
$304,800	$86,150	121	35	156	295
300,340	93,220	140	39	179	299
4,460					
	7,070	19	4	23	4
1,300,752	533,995	1,377	51	1,428	246
1,071,303	343,825	1,032	13	1,045	241
229,449	190,170	345	38	383	5
3,973,652	814,036	1,289	835	2,124	290
1,659,399	315,446	653	379	1,032	268
2,314,253	499,590	636	456	1,092	22
1,235,989	387,494	760	179	939	285
945,842	231,866	363	173	536	238
290,147	155,628	397	6	403	47

INDUSTRIAL CHRONOLOGY.

INDUSTRIAL CHRONOLOGY.

Alstead. 1897, May. The Davis Mica Company ship refuse scrap mica from their mine to Richmond, Va., to be used for electrical purposes.

Alton. 1897, August. A temporary annoyance was caused at the G. R. Coburn Shoe Factory by the demand of the foreman of the stitching room for an increase in his salary. The operators under him drew up a petition and presented it to the superintendent, asking for the increase and that some of his duties be diminished. The firm refused the request, and the superintendent resigned. The operators left their work in a body, and in so doing emphatically declared that they would not return until their superintendent was reinstated at an increased salary. The firm claimed that the superintendent's position was one of the best in the shop, and that the salary paid was fully equal to that paid for like services elsewhere. Several of the thirty operators who went out left town and found employment.

Antrim. 1897, November. The Goodell Cutlery Company made a reduction of five per cent in the wages of their employees in the finishing department. Ex.-Gov. D. H. Goodell, president and practical owner of the concern, employed about 250 hands, and during its twenty-five years existence it had never before experienced any labor troubles. Twenty-five employees went out.

Ashland. 1897, May. The Sanborn Paper Box Company had a daily output of over 1,000 boxes during the month.

1898, January. The J. F. Draper Company, glove manufacturers, after a month's suspension on account of financial troubles caused by the death of a large creditor, started up again under a new corporation, capital $25,000, with 100 hands, under the title of the Draper-Maynard Company.

1898, January. The Ashland Knitting Company resumed business (after a two months' shut-down) with 250 hands and plenty of orders ahead. The company's capital stock has been increased from $50,000 to $100,000; has added forty new three fourths automatic and eight full automatic knitters; 250 hands are employed, with a weekly pay-roll

of $1,400. The product of the mill is 600 pairs of hose per day, besides having part of the work done by outside mills. The cards run nights as well as part of the knitters.

1898, February. The top hands struck for an increase of one half cent per dozen at the Ashland Knitting Company.

Barnstead. 1897, December. The rush of business at the shoe shop brought a demand for more help. A steam shingle mill, 36x34 feet, two stories, was erected.

Bartlett. 1897, October. Twelve thousand acres of timber land were purchased by the Bartlett Lumber Company.

Bath. 1897, October. A new lumber mill was built, 100 feet long and 30 feet wide, two stories, and operated by steam. Employs 30 men.

Belmont. 1897, April. The top knitters at Gilmanton Mills went on a strike for increase of wages, demanding a restoration of prices paid in 1892. After a few days a compromise was effected, and the men returned to their looms. The woolen machinery in this mill was sold to Massachusetts parties, and cotton machinery was substituted.

Berlin. 1896, July. The Burgess Sulphite Mill was destroyed by fire; this plant was immediately rebuilt upon an enlarged scale, increasing number of employees.

November. The Glen Manufacturing Company purchased the Nulhigan Lumber Company plant in Upper Coös for $500,000.

August. The Glen Manufacturing Company installed three additional paper machines, and with other improvements, the company doubled their output, and employed a third more help, which now number five hundred, all men. One hundred and thirty-five tons of finished news paper are manufactured per day, using one hundred cords of wood for the sixty tons of sulphite pulp, and 60,000 feet of lumber for the one hundred tons of ground pulp. Ten tons of sulphur are used daily. The company has built the last year a new forty ton per day capacity pulp mill. The monthly pay-roll is $25,000.

1897, January. The lasters at Chick Brothers Shoe Factory went out on a strike for higher wages, demanding an increase of one half a cent per pair over old prices. The lasters returned to their work after being out two days. This was Berlin's first experience with a strike.

1897, February. The Glen Manufacturing Company completed an addition to their plant which is known as Mill No. 3. The company added new machinery, engines, etc., to Mills Nos. 1, 4, and 6 of the mammoth plant, which improvements largely increased the productions, and made it the largest news paper making plant in the world, producing 120 tons of paper daily. The weekly pay-roll is $7,000.

The Burgess Sulphite Company also added to its immense plant, which together with the Glen company's improvements cost more than one million dollars. The Burgess company purchased seven million feet of pulp wood delivered on the east branch, and gave employment to one hundred more men.

1897, June. One day in June the Berlin Mills Company manufactured 243,000 feet of long lumber besides the usual product of laths, clapboards, shingles, etc.

1897, July. The Berlin Mills Lumber Company plant was destroyed by fire. The company rebuilt, the new mill being two stories, 235 feet long and 60 feet wide, with an addition on south end of 180 feet for assorting and loading lumber. The plant is the finest equipped in the state with the latest improved machinery, which has substituted labor in the handling of the lumber. The plant is run night and day, 200,000 feet of lumber being manufactured every twenty-four hours. Sixty million feet of lumber are manufactured yearly. The machinery and plant cost $200,000, an increase of $50,000 over the old plant. Three locomotives are used in the yard; 200 men are employed, with a monthly pay-roll of $8,000. The company furnish a kindergarten school with three teachers for the children of their help, besides furnishing billiard and reading rooms. With less employees than formerly, the capacity of the mill has been greatly increased.

1897, September. The wood-working mill of the Berlin Mills Company was burned; rebuilt at once with improved machinery.

1897, December. During the week ending December 4, the Berlin Shoe Factory shipped 15,408 pairs of shoes. The pay-roll for six months previous was $50,000.

1897, December. The storehouse of the Glen Manufacturing Company was destroyed by fire.

The Burgess Sulphite Fibre Company doubled the capacity of the plant the past year in the mill proper. The mill is run night and day, stopping only for repairs. Their daily product is 210 tons of air dried pulp, using 80,000 cords of peeled spruce wood per year. Twenty-five to thirty tons of sulphur are used daily, and at time of writing the company had over $200,000 worth of sulphur on hand. Three thousand men are employed by the firm, 450 of whom work in the mill. The pay-roll is $20,000 per month.

1898, January. The Glen Manufacturing Company joined the International Paper Company.

1898, January. Two thousand five hundred men were given employment during the winter lumbering, the lumber cut for Coös county being

estimated at 225,000,000 feet. The Berlin mills run 75,000,000 feet down the Androscoggin river, and the Connecticut River Lumber Company, 50,000,000 feet. Twenty thousand pairs of shoes were finished and shipped from the Berlin Shoe Factory the first week of the month.

Boscawen. 1897, June. The Brick works furnished 800,000 brick for the hosiery mill of A. W. Sulloway at Franklin.

Bristol. 1897, September. The Bartlett & Fleer Shoe Factory secured additional room in adjoining building for cutting and packing room.

Brookline. 1897, November. A file factory was erected, 80 feet long and 30 feet wide, and one and one half stories high. A new factory was erected by H. Marshall & Co., of Boston, and used for the manufacture of wooden type.

Canterbury. 1897, July. The wood-working establishment of C. M. & A. W. Rolf placed a new engine to propel their machinery in time of low water.

Carroll. 1896, September. G. F. Whitcomb and Oscar Barron's creamery was burned. Total loss, $12,000.

(Zealand). 1897, May. Lumber mills and machinery were destroyed by fire. Loss, $84,700; no insurance.

Charlestown. 1897, April. An addition was made to the planing-mill of a two-story building, 30 feet long and 42 feet wide.

Chichester. 1897, October. The saw and grist mill was enlarged to two stories, the approximate size being 60 feet long and 30 feet wide.

Claremont. 1896, December. Fire destroyed the bakery of R. E. Wilcox; loss, $275.

1896, June. The Washburn Shoe Company was organized and began business in the building owned by the Claremont Improvement Company. One hundred and fifty hands were employed.

Concord. 1896, January. The John H. Flood Polishing Shop burned.

1896, February. The Prescott Piano Company destroyed by fire.

1896, May. The Concord Foundry burned.

1896, December. The furniture manufacturing plant of Amsden & Sons at Penacook started up by a corporate management, employing the full complement of hands.

1897, June. The Abbott & Symonds Company of Penacook merged in the J. E. Symonds Table Company, with a capital of $42,000.

1897, November. "The starting up of work in the new railroad shops in this city, and the announcement of the removal shortly to this point of operations in certain lines of work heretofore carried on in other

places, calls up the protest made in some quarters against the union of the Concord & Montreal with the Boston & Maine, on the ground that it would prove detrimental to the welfare of the city. It is true that a few trainmen, and some minor officials and clerks, were put under the necessity of making their homes elsewhere, but the loss is far more than counterbalanced by the advantage which the location of the new shops here brings to Concord. But for the work here afforded, and the greatly increased operations sure to be carried on in the near future, the industrial outlook in the capital city would be dark indeed. The largest private manufacturing concerns pronounce business in the worst shape ever known, and the 'Monitor's' reminder just before Thanksgiving that many destitute and suffering families are to be found in our midst, serves to strengthen the generally accepted belief that the coming winter is to be the hardest known for years so far as Concord is concerned."

"Concord granite has been widely known as a first-class building stone for many years. Some of the finest buildings in the country were constructed with it, and for trimmings, monumental work, edgestones, and some other uses it was formerly in great demand, and the business of quarrying and cutting it was perhaps Concord's most important industry. A large amount of money was invested in it by capitalists, and a large number of workmen had steady employment in it at good wages; but it has recently suffered a great decline. The largest firms have abandoned their quarries and sheds and located elsewhere, leaving but a few small operators to supply the small local demand.

"Various causes have contributed to this. The contractors had serious trouble with the labor unions. Competition became very sharp. The cost of living in Concord was thought to be higher than elsewhere; and finally and most important the quarries on Rattlesnake hill were located a considerable distance from the railroad, to which the stone had to be hauled with teams at large expense.

"The result of the exodus of the stone men was a great depression in the mercantile business and a great depreciation in the real estate valuation of the city, and when to the loss of this industry was added a great curtailment in the operations of the Porter Shoe Factory, the Abbott-Downing Carriage Company, the Hill Harness Company, the failure of the Amsden Furniture Company. Concord seemed to be passing into a decayed or decaying state.

"The establishment of the Boston & Maine car shops at the south end has done something to restore vitality in that section, and in a measure offsets the losses elsewhere, but only in a measure; and the citizens,

if we may judge from the local papers, have at last been forced to the conclusion that they must do something to recover their lost industries, or secure new ones, in order to enjoy the prosperity they formerly had. One proposition is that the city shall build a railroad to Rattlesnake ledge at a cost of $50,000, and another that by offering special inducements in the way of exemption from taxes, or the furnishing of rent and power at nominal prices, outside manufacturers shall be made to see that it is for their interest to locate in Concord.

"Thus far there is nothing but talk and it may end in that. It takes something more than newspaper and sidewalk discussions and commercial club resolutions to locate factories or stone sheds in these days; but even talk shows that Concord has been brought to a realizing sense of the mistake she made in letting her employers of labor slip away from her.

"We refer to this, first, because we sincerely hope the movement for a recovery of the business that has been lost to Concord will succeed; and, secondly, because the situation there ought to teach Manchester and every other New Hampshire city and village a lesson. It is much easier to lose an industry than to gain one. It is easier and cheaper to treat one so well that it will stay than to coax one away from some other place.

"The manufacturers of our state labor under some disadvantages. Most of them are located long distances from their base of supplies, and the markets in which their products must be sold. Competition in all lines of production is very sharp, and margins at the best are very small. Only those who can turn out goods at a minimum cost can sell them at a profit, and he who can not sell at a profit must shut up shop or move.

"Concord has not suffered because there is no longer the usual demand for granite, carriages, harnesses, furniture and shoes, but because producers elsewhere have been able to supply the demand at less prices than her people could offer. With this in view it is plain that a town in which taxes are very high, in which the cost of living is greater than in others, in which lack of railroad facilities adds to the expense of raw material and the shipment of goods, in which there is continual strife between labor and capital, in which factory employees are not well treated in every way, can not expect to hold its business, much less to secure additions to it. The time to think of these things is before the shops and sheds are vacated."

Conway. 1897, May. The Conway Spool Mill run over time.

Derry. 1897, January. The Derryfield Shoe Factory was burned. The factory was built and owned by the Derryfield Building Association.

It was leased to H. L. Harris & Co., of Haverhill, Mass. One hundred employees were thrown out of work.

1897, May. The Coburn, Fuller & Co., shoe manufacturers, built a storehouse, 40x36 feet. All the business of this firm was transferred from Milford, Mass., to West Derry where the two large factories run on full time. The Pillsbury Shoe Factory at Derry has facilities for making 5,000 pairs of shoes per day, the firm's shipment of shoes for one month amounting to $250,000, and the pay-roll for October being $18,000.

1897, October. The Coburn, Fuller & Co., purchased the box factory of Gilman A. Wheeler, and began the manufacture of their own boxes.

Dover. 1897, December. The Ireland Shoe Shop paid in wages for the year ending Dec. 31, 1897, $155,000. The Moulton Shoe Factory paid $57,000 during the same time.

1897, October. The Somersworth Machine Company shipped fourteen orders of goods to Japan the past year. Three hundred hands were employed.

1898, February. The employees of the Sawyer Woolen Mills received a five per cent increase in wages.

Effingham. 1896, March. The Morse Lumber Mill was burned.

1896, September. The Parsons Grist Mill was destroyed by fire. Two grain and lumber mills were built. One of them was 102 feet long and 32 feet wide, and the other 50 feet in length by 30 feet in width; both one-story buildings.

Enfield. 1897, April. The picker room of the Baltic Woolen Mill burned.

1897, June. A three-story mill for the manufacture of yarns was erected, 100 feet long by 56 feet wide, at an estimated cost of $20,000. A picker room in place of the one burned was added to the Baltic Mills, the dimensions being 30 feet in length by 16 feet wide, two stories.

Exeter. 1896, January. The Cogswell & Co. Shoe Factory was destroyed by fire.

1897, October. The Exeter Boot & Shoe Company made the largest shipment of men's shoes ever made in one day from here.—228 cases. The same company signed a check for $42,950, and two others of large amounts, making in all some $60,000 within a few days in the purchase of stock.

1898, January. The Exeter Manufacturing Company made their first reduction in wages of their employees in twenty years. The cut was ten per cent. Two hundred and fifty hands were employed, 25,000 spindles running, and the weekly pay-roll was upward of $1,650. The

reduction in wages was made necessary by close competition and the reduction in other New England mills.

John H. Fellows erected box factory, 100 by 40 feet, two stories in height, steam power, to employ thirty operatives.

FARMINGTON. 1896, November. Wedgewood & Sanborn's mill was burned.

1898, February. The heel factory of Wesley J. Nutter burned with stock and machinery. Thirty hands were thrown out of employment.

FRANKLIN. 1896. The Franklin Needle Company received a new electric dynamo and motor of 32-horse power capacity for power and lighting purposes.

1897. The Mayo Knitting Machine and Needle Company secured additional floor room, owing to increasing business.

The Kidder Machine Company erected a new storehouse.

1898, April. The hosiery machinery in the Fay Mills at Tilton was purchased and removed to the Sulloway Mills at Franklin.

FREMONT. 1897, July. Cooperage mill, 70x40 feet, two stories in height; steam power; working twenty operatives. Two hosiery mills erected, one of which is 60x30 feet, and the other 175x100 feet, four stories in height, to employ 130 hands. Box factory 60x30 feet, three stories in height, to run by electric power, giving employment to twenty-five persons.

GILSUM. 1898, March. The employees of the Gilsum Woolen Mills received an increase of five per cent in their wages.

GORHAM. 1896, November. The upper lumber mill of E. Libby & Sons was burned, the loss being $8,000. In August, 1897, the mill was rebuilt and $10,000 worth of new machinery put in. Bobbin machinery was made a new feature of the plant in addition to the manufacture of long lumber and square stock. When run at full capacity fifty men are employed.

1897. The eastern division of the Grand Trunk Railroad largely increased their help in the repairing of locomotives.

GREENVILLE. 1896, November. The Columbian Mills resumed business after a shut-down of six months; 150 hands were employed.

HAMPTON. 1898, February. The shoe factory formerly occupied by V. R. & A. H. Jones of Lynn, Mass., which has remained unoccupied for several months, reopened by Hampton Boot and Shoe Company. The machinery is all new, and is in part as follows: Six "Nigger Head" or Consolidated lasting machines; three tacking-on machines; four McKay sewers; two Giant levellers; two Fair stitch machines; one McKay-Biglow heeler; two heel trimmers; three forepart trimmers; four edge set-

ters; two heel scourers; three buffers; two heel edge finishers, etc. In the sole leather room there are five beam cutters, and the latest machinery in channelling. The cutting and stitching rooms are running Fifield's vamp skiver and tip marker. The factory will produce a medium line of men's satin calf, etc. There is installed an electric lighting plant of 250 lamps, and a telephone system which will bring the office into ready communication with every floor of the factory, also with every floor of Gale's other factories at Exeter; also a complete burglar alarm, and a clock which electrically records to exact time the nightly rounds of the watchmen. To supplement the automatic sprinkler service, backed by a 5,000-gallon tank, is connected a powerful steam pump which will throw 500 gallons a minute through 600 feet of hose, and has an additional water supply from a 20,000-gallon tank.

1898, March. The pay-roll at the Hampton Shoe Factory is upwards of $1,000 per week.

Hillsborough. 1898, February. The employees of the Hillsborough Woolen Mills received a five per cent increase in wages.

Hinsdale. 1897, October. The wages at C. J. Amidon & Son's Woolen Mill were restored voluntarily to the rates paid previous to the cut-down.

Hooksett. 1896, December. The Hooksett Mills resumed work after a shut-down of fifteen weeks. Three hundred hands are employed in the manufacture of cotton goods.

1897, December. Hooksett Mills added No. 3 Mill, 144x56 feet, two stories in height; forty employees; also erected engine and boiler rooms, 66x55 feet, two stories in height.

1898, January. The Hooksett Hosiery Mill ran night and day this month.

Hopkinton. 1897, March. The wood-working machinery shop of W. S. Davis was burned. The establishment was rebuilt and enlarged.

Jaffrey. 1897. Two cotton mills were erected, 130x50 feet, four and one half stories in height, steam and water power, employing 150 hands, and 120x38 feet, two stories in height, steam and water power.

Keene. 1896, June. The finishing room of the Keene Furniture Company was burned.

1897, June. The Faulkner & Colony Manufacturing Company completed improvements in their West street woolen mill, and later on added new machinery.

1897, November. The Trinity Cycle Company moved to Keene from Worcester, Mass., and began manufacturing bicycles. In January, 1898, the company was employing 150 men and working thirteen hours per day.

1898, January. The Keene Wood-Rim Company moved to Rutland, Vermont.

The locomotive repair shop of the Fitchburg Railroad was centralized in Keene, and its capacity both in plant and employees was doubled.

Laconia. 1896, October. The Laconia Car Company, after an existence of many years, went into the receiver's hands. A new company known as the Laconia Car Works Company was organized and took possession in December, 1897, with Hon. Frank Jones of Portsmouth as president and controlling owner. Many of the old shops of the establishment were torn down and new buildings erected and equipped with modern appliances and machinery, greatly improving the facilities of the plant. A malleable iron foundry is one of the features of the establishment. In March, 1898, business was resumed, some four hundred mechanics finding employment. When run at full capacity they will run between six and seven hundred men. The company build cars for both steam and electric roads, and started in with large orders. The city of Laconia exempts the company from taxes for a period of ten years.

1896, February. The Waverly Shoe Company moved to Laconia from Worcester, Mass., and began manufacturing. The company occupy a three-story building at Casino Square, rebuilt for their accommodation by a syndicate of the citizens. One hundred and twenty find employment. The capital of the company is $62,000.

1896. The Halifax Hosiery Mill went into the receiver's hands, and was purchased by Leonard & Clark, of Boston, who continued the business in a small way for nearly a year. For several months in the latter part of 1897 business was suspended. In February the company purchased a large stock, and with plenty of orders ahead, resumed business with 150 hands. It was the company's purpose to add another hundred employees soon after. The sudden death of Mr. Leonard at Boston the day of reopening the mill caused the closing of the mill for good.

1898, February. F. P. Rowe started up in the hosiery business employing thirty-five hands.

1898, February. The Hodgson & Holt Manufacturing Company, makers of hosiery, resumed work after several weeks' shut-down. A new scale of prices was presented to the knitters, which they refused to accept, but after a few days of deliberation they went to work under the new schedule of prices.

1898, February. The Cole Manufacturing Company, which had been running on short time for the past year, began to run a day and night force and continued it for several months to fill orders.

LINCOLN. 1897, November. J. E. Henry & Son employ this season more than a thousand men lumbering.

1897, December. The Henry Mills added a dressing mill and dry-house, 100x80 feet, of wood, to employ twenty hands; building cost $10,000.

1898, January. The Henry Mills are logging 350,000 feet per day on snow roads, and have added to their lumber plant an extensive kindling-wood factory.

1898, March. Thirty million feet of logs landed at the Henry Lumber Mills during January, February, and March. The kindling-wood factory is 40x40 feet, and 88 feet high; cost, $18,000; will require eighty hands to operate same.

LISBON. 1897, January. The Lisbon Electric Power Company installed a set of sawmill machinery. The Parker & Young Company run their works over time to keep pace with orders.

1897, December. Addition to Parker & Young Manufacturing Company's plant, 60x30 feet, three stories high, of wood, steam power. There was also erected a peg mill, 60x35 feet, three stories in height, of wood, for steam power; also a bobbin mill, 55x40 feet, two stories high, steam power, sawmills, 38x28 feet, with addition 60x15 feet, of wood, for steam power.

1898, January. A new peg mill was built, Nelson & Moore owners. Twenty hands are employed, and the yearly product is 35,000 bushels of shoe pegs. The pegs are shipped to Germany as a distributing point. Eleven thousand dollars are invested in plan and machinery.

LITTLETON. 1897, January. The Littleton Shoe Company are shipping 4,500 pairs of shoes a week; their pay-roll is $3,000 a week. Addition to shoe factory (two stories added), at a cost of $3,500.

LYNDEBOROUGH. 1897, December. Box factory, saw and dressed lumber; mill erected of wood, 60x50 feet, two stories and basement, steam and water power; cost, $8,500.

MANCHESTER. 1897, September. Amoskeag Corporation and the Amory Mills resume work. More than 8,000 operatives are again upon the pay-rolls.

1897, October. The treasurer's report for the Amoskeag indicates the production of 95,303,110 yards of cloth during the year; the earnings for the first six months were $80,132.33, and for the last six months they lost $3,814.33. As a five per cent dividend of $200,000 was paid, the corporation lost $123,382. At the annual meeting of the Stark Mills, the matter of building a new mill in the southern states by an increase in capital stock of $2,000,000 was indefinitely postponed. At

the Amory Mills annual meeting, two semi-annual dividends of four per cent were declared earned, and paid on the capital stock for the year just ended, with more cloth on hand unsold than ever reported in the history of the corporation at an annual meeting.

1897, December. The Kimball Shoe Factory, at East Manchester, is running 11¼ hours a day to keep up with orders. Notices of a ten per cent reduction are posted in the Amory, Amoskeag, Jefferson, and Stark Mills; this cut in wages affected more than 20,000 workers. The Amoskeag plant occupies sixteen mills, running 300,000 spindles and 10,000 looms. The Stark produces 2,000,000 yards of cloth per week, employing 8,000 hands; monthly pay roll, $225,000, paid fortnightly. The Amory Mills occupy three mills, running 122,116 spindles, 3,000 looms, 1,100 employees; monthly pay-roll, $35,000, paid fortnightly; produce 10,097 yards of cloth per week.

1898, January. The Manchester Mills stop 1,140 looms. Reduction of ten per cent in wages at the Amory, Amoskeag, Jefferson, Manchester, and Stark Mills. At Goffe's Falls the Manchester Mills corporation erect a large woolen mill, 300 feet long and 43 feet wide, three stories in height; equipped with latest modern machinery.

Milan. 1897, April. The Ammonoosuc Lumber Company landed this season 20,000,000 feet of lumber at their mills in West Milan.

Milford. 1897, October. Bartlett & Sons put in a new boiler and otherwise added improved facilities for their rapidly increasing business.

1898, February. French & Heald's furniture factory and the McLane Basket Works reduce wages of their operatives.

Nashua. 1897, April. Nashua Card and Glazed Paper Company running five days each week, on account of lack of orders.

1897, September. Nashua laboring men have spent more than $120,000 for bicycles in the past two years, a euphony of "hard times."

1897, November. A petition asking for a nine-hour day was passed among laboring men. It was generally signed as the petition asked for ten hours' pay for nine hours' work. The movement was under the management of speakers and organizers from Massachusetts, largely in the interest of journeymen plumbers and gas-fitters.

1898, January. Reduction in wages at the Nashua and Jackson cotton mills, affecting 2,500 operatives, who accepted the reduction and continued work, with no indications of a strike.

The Jackson Manufacturing Company installed a new 1,800 horse-power engine of the latest improved pattern.

1898, February. The Vale Cotton Mills ceased operations after an existence of fifty-three years, the stockholders having deemed it inadvisable to continue the manufacture of cotton goods.

NEWPORT. 1897, August. The Newport Shoe Company renew lease of premises occupied for an additional period of ten years. In December erect shoe factory 150x42 feet, three stories high, of wood, with water power.

NEWMARKET. 1898, January. The Newmarket Manufacturing Company make a general reduction in wages of operatives and officers, taking effect January 17.

1898, March. New machinery for silk weaving in the mills of the Newmarket Manufacturing Company installed.

NEWTON. November. Additions to shoe shops, 23x17 feet, two stories, and 20x16 feet, one story, all of wood, for steam power.

PITTSFIELD. 1897, December. A business deal of considerable magnitude, and the largest that has been consummated here for many years, is the purchase of the Pittsfield cotton mill by G. E. Kent, who has been agent of the plant for the past eighteen years. The deal involves not only the change of proprietorship of the mill, but all interests connected therewith in the adjoining towns in which are located valuable mill privileges. The change of ownership will also bring about some changes in the business of the mills, one of which will be the manufacture of a finer grade of goods, and the removal, at some future date, of the bleaching department to the Exeter mill, in which Mr. Kent is interested.

The matter has been the theme of much earnest discussion on the street, the fear being expressed that the change meant the absorption of the mills by the Exeter Mills Company to the detriment of the business here. From an interview with Mr. Kent regarding the matter it does not appear that anything of the kind is likely to occur. Mr. Kent has become the sole owner of the property, and proposes to keep the wheels going just the same in the future as they have in the past.

The nucleus of the property which has just changed hands was established in 1827. At that time both the raw material and the products of its looms were freighted across the country to Portsmouth, some forty miles distant, and then by water to Boston until the building of the Concord & Portsmouth road. The route was then changed to Concord, sixteen miles distant, and so continued until the Suncook Valley road was built in 1869. But very little change was made in the original plant until 1872, when new machinery was put in. In 1877 it passed to the management of Mr. Hovey of Boston, of whom Mr. Kent purchased it. Since then many thousand dollars have been expended in making additions to the mills and machinery and building a stone dam. The property in town alone is now assessed at nearly $100,000. Some 250 operatives find employment about the mills, for which labor between

$60,000 and $70,000 are annually paid out. The product of 14,000 spindles and 300 looms is 3,000,000 yards per year. The mills have one of the most magnificent water powers in the state. They have the undisputed control of the Suncook river and adjacent ponds to their source at the foot of Mt. Belknap in the town of Alton. This immense water power is held in reserve by six large dams along its course and gives nearly 400 horse power even in a protracted drought.

1898, January. A ten per cent reduction in wages went into effect at the Pittsfield Mills. The 250 operatives accepted the cut without opposition. The plant is a private one, owned by George E. Kent, agent of the Exeter Manufacturing Company, of Exeter, which purchased the property about one year ago. Its equipment is some 12,000 spindles and 300 looms, the product of which is 3,000,000 yards per annum of fine grade cloth. The new schedule has been adjusted to bear as lightly as possible on those who earn the smallest wages. The annual pay-roll has been upward of $60,000.

Portsmouth. 1897, May. The Morley Button Works produce a new style of button.

1897, October. Morley Button Works increase facilities.

1897, November. Additional help was put on, and new machinery added.

1897, December. One hundred feet were added to the Morley Button Factory.

1898, March. Extensive improvements adopted at Morley Button Factory, many new styles of goods produced, and working force on pay-roll increased.

Rindge. 1897, January. Union Box Company resumed work on full time.

Rochester. 1897, April. A. Y. Pearl produced and patented a drill cutting a square hole in metals.

Rollinsford. 1897, June. The mills of the Salmon Falls Cotton Manufacturing Company resumed a full-time schedule, after having been two thirds time for six months.

1898, January. A new schedule of wages involving an average cut of ten per cent went into effect at the mills of the Salmon Falls Manufacturing Company; 600 employees accepted the new rate, and continued work as usual; capacity of mills, 60,000 spindles; average weekly pay-roll is $4,500.

Salem. 1897, May. Woolen mills of J. W. Wheeler resumed after a period of six months idleness. The Dustin Mills sold to A. Slack of Lawrence for manufacture of hair-cloth.

1897, June. The Evans Artificial Leather Company, Manchester, has sold to the Boston Artificial Leather Company, Concord, for $85,510.91, its mills at Salem, with all machinery, goods, and material therein, the contents of its store in Boston, notes receivable and all other assets. The consideration is much the largest for deeds recorded in Rockingham county for several years.

1897, November. Palmer & Son erected a shop for the manufacture of heels. Hanson & Taylor build a large flume and penstock for their factory.

1897, December. T. M. Russ's Shoe Factory resumed on full time schedule after remaining idle two months.

Seabrook. 1897, May. The W. P. Bradford Shoe Factory was destroyed by fire; also the Poor & Dole Shoe Factory was burned; total loss, $15,000.

Somersworth. 1897, September. Mills of Great Falls Manufacturing Company resumed full time schedule, working 1,000 hands. The Somersworth Machine Company, after a two weeks' suspension, resumed operations June, 1898.

Stoddard. 1897, September. Sawmill was erected, 80x34 feet, of wood, for steam power.

Strafford. 1897, April. The Bow Lake Shoe Factory was leased by Daniel O'Neill, a Holyoke, Mass., shoe manufacturer.

Swanzey. 1897, August. Erected wooden-ware and pail factory, 70x54 feet, two stories in height; water power for working forty people.

1897, September. An addition to bucket mill, 56x25 feet, two stories in height, water power.

Tamworth. 1897, June. Chair stock mill, 60x30 feet, two stories, of wood, for steam power.

1897, December. L. D. Bartlett & Son produced the past season 4,000 dozen hand hay rakes.

Troy. 1897, August. Box factory, 100x40 feet, of wood, for steam power.

Warner. 1898, February. At a special town meeting voted to exempt the property of the Warner Shoe Company for a period of ten years, and the shoe company leased two buildings of the Merrimack Glove Company.

Weare. 1897, May. The Clover-Leaf Creamery Association of East Weare incorporated; capital, $100,000.

Wentworth. 1897, July. Sawmill, built of wood, 40x15 feet, for steam power, working thirteen employees. Sawmill addition, 50x20 feet, built of wood, for water power.

WESTMORELAND. 1897, August. Steam sawmill, built of wood, 100x50 feet.

WHITEFIELD. 1896, December. The Maine Condensed Milk Company, at Newport, Me., established a branch of the business at Whitefield, nearly half of the stock being subscribed in town. The company erected a two and one half story brick building, 200x40 feet, with a separate building for office purposes. The factory has cemented and hard wood floors, and the latest modern machinery is used, the condenser costing $3,000. The Boston & Maine and the Maine Central railroads have side tracks to the building. Twelve thousand quarts of milk are brought to the factory daily, and during the past year the farmers have received $64,423.87 in return, or a little over $5,000 per month. Business has improved from the start, and for the year ending May 1, 1898, the sales increased $97,719.24 over previous year. Twelve thousand cans, one pound to a can, is the daily product. Two tons of granulated sugar are used every day, and the tin cans used are manufactured on the premises. $10,081.41 was paid in wages for the year. The officers of the company at Whitefield are: President, A. I. Brown; treasurer, Van H. Dodge; general manager, J. B. Rackliff; superintendent, E. R. Dow.

1898, May. The monthly pay-roll of the Whitefield Condensed Milk Factory was $6,000.

MANUFACTURES.

STATISTICS OF MANUFACTURES.

The following tables show an era of prosperity dawning upon New Hampshire manufactures the past year, in place of the period of commercial depression which has affected nearly every industry in the state. Capital invested has been increased, and more material used, more persons employed, more money paid for wages, and a marked increase in value of product.

Our comparison made between a general average of reports for years 1893, '94, '95, and '96, and returns made to this bureau of 1897 fully demonstrate the conclusions above mentioned.

The absence of strife, contention, or friction between labor and capital may be said to indicate the more healthy condition of business made possible by the judicious management of the Labor Bureau.

ANALYSIS.

The 350 establishments making returns to this bureau for 1897-98 include 43 industries, showing $34,422,907 invested capital. Cotton goods represent by far the largest amount of capital invested in any industry, the 13 establishments considered reporting $13,147,207 capital, boots and shoes following with 22 establishments and $3,529,961 invested capital, and 38 establishments show $3,995,900 invested in lumber mills, and 13 establishments in woolen goods report an investment of $2,591,500 capital. The invested capital in 15 establishments in the hosiery industry is reported as $1,425,500.

The cost of material used in said 350 industries was $24,903,156, as follows: Cotton goods, $7,546,550; boots and shoes, $6,711,398; woolen goods, $2,538,840; lumber mills, $1,444,133, and hosiery, $978,028. The total paid in wages by the 350 establishments reporting was $11,394,717; cotton goods with 13 establishments paid $3,208,176; boots and shoes, $2,772,046 in 22 establishments; lumber mills paid in 38

establishments, $874,148, and 13 establishments in woolen goods paid in wages, $814,036, and $530,277 paid by 15 establishments in hosiery.

Seven industries report over a million dollars each in value of product, to wit: Cotton goods, $15,677,296; boots and shoes, $10,288,431; woolen goods, $3,973,652; lumber mills, $2,564,186; hosiery, $1,844,203; wooden goods, $1,300,752, and cotton and mixed textiles, $1,033,457. The 350 establishments considered employ 33,466 wage-workers, of which 21,007 were males and 12,459 females; of this number 12,350 were employed in the cotton goods industry, of whom 7,162 were females; boots and shoes employed 6,314, of whom 1,919 were females; lumber mills, 2,490; hosiery, 2,099, of whom 1,305 were females; woolen goods, 2,124, and wooden goods, 1,428.

The average number of days the 350 establishments were run was 283. Oils and illuminating goods run full time, 365 days, and some of the food preparation establishments also run full time (365 days), and the days some establishments were run dwindled down to 130 for brick and tile. Many industries show a marked increase the past year as compared with the average of same industries as reported for the years of 1893, '94, '95, and '96, while but very few a decrease, as shown by comparative tables for the years 1893 to 1897.

STATISTICS OF MANUFACTURES

1897-1898.

STATISTICS OF MANUFACTURES—1897-1898.

Compiled from returns made to the Labor Bureau from 350 establishments.

	No.	Industries.	Capital invested.	Cost of material.	Total wages paid.
	350		$34,422,907	$24,903,156	$11,394,717
5	22	Boots and shoes	$3,529,961	$6,711,398	$2,772,046
6	11	Boxes, wood, and paper	176,500	178,326	86,390
7	10	Brick and tile	240,000	39,896	61,791
9	5	Building and contracting	125,000	118,700	167,907
11	5	Carriages and wagons	121,000	43,346	34,338
15	11	Clothing	337,800	422,683	169,025
16	10	Cooking and heating apparatus	181,320	203,748	61,447
18	13	Cotton goods	13,147,207	7,546,550	3,208,176
19	5	Cotton and mixed textiles	870,000	712,749	289,403
29	24	Food preparations	231,444	460,967	73,772
30	12	Furniture	440,000	230,247	158,897
34	15	Hosiery	1,425,500	978,028	530,277
37	8	Leather and leather goods	520,000	292,920	58,892
40	38	Lumber mills	3,995,900	1,444,433	874,148
41	15	Machines and machinery	876,100	411,909	397,613
42	11	Metallic goods	665,300	268,081	107,099
46	4	Oils and illuminating goods	1,015,059	35,735	11,378
48	6	Paper and paper goods	867,379	557,198	139,706
52	15	Printing and publishing	144,050	42,812	63,878
58	20	Stone and stone products	677,006	102,159	306,859
61	2	Tobacco and cigars	79,500	192,091	86,150
65	54	Wooden goods	1,298,237	642,844	533,995
66	13	Woolen goods	2,591,500	2,538,840	814,036
68	21	Miscellaneous	867,150	697,496	387,494

STATISTICS OF MANUFACTURES—1897-1898.

Compiled from returns made to the Labor Bureau from 350 establishments.

	No.	Industries.	Value of product.	Employees.			Average days run.
				Males.	Females	Total.	
	350		$44,445,183	21,007	12,459	33,466	
5	22	Boots and shoes	$10,288,431	4,395	1,919	6,314	285
6	11	Boxes, wood, and paper	290,765	176	67	243	290
7	10	Brick and tile	120,800	252	2	254	130
9	5	Building and contracting	332,500	302	.....	300	300
11	5	Carriages and wagons	92,680	81	.....	81	297
15	11	Clothing	709,800	183	403	586	299
16	10	Cooking and heating apparatus	306,149	132	1	133	331
18	13	Cotton goods	15,677,296	5,188	7,162	12,350	276
19	5	Cotton and mixed textiles	1,033,457	523	361	884	294
29	24	Food preparations	614,903	181	24	205	300
30	12	Furniture	452,699	356	14	370	285
34	15	Hosiery	1,844,203	794	1,305	2,099	274
37	8	Leather and leather goods	427,163	134	.....	134	293
40	38	Lumber mills	2,564,186	468	22	2,490	242
41	15	Machines and machinery	977,611	841	.....	841	302
42	11	Metallic goods	394,508	243	4	247	289
46	4	Oils and illuminating goods	55,378	24	.....	24	365
48	6	Paper and paper goods	822,020	354	33	387	276
52	15	Printing and publishing	142,425	109	33	142	299
58	20	Stone and stone products	482,116	724	9	733	251
61	2	Tobacco and cigars	304,800	121	35	156	295
65	54	Wooden goods	1,300,752	1,377	51	1,428	246
66	13	Woolen goods	3,973,652	1,289	835	2,124	290
68	21	Miscellaneous	1,235,989	760	179	939	285

TAXATION STATISTICS.

EXTRACTS FROM REPORTS OF STATE BOARD OF EQUALIZATION.

CONCORD, N. H., December 1, 1897.

The secretary of the Board of Equalization has made a compilation of the valuation and taxation of the state from the inventories and returns of date April 1, 1897. Comparison is made with figures of 1896. The following summary is presented:

	1897.	1896.
Valuation by inventories	$203,507,734	$200,957,600
Savings bank deposits taxable	50,859,365	56,884,200
Insurance capital	1,375,000	1,275,000
Total	$255,742,099	$259,116,800
Decrease in savings bank deposits		$6,024,835
Increase in inventories		2,550,134
Increase in insurance capital		100,000
Net decrease for year		$3,374,701

Subjoined is a table by counties of valuation and taxes assessed in all cities and towns for 1897 compared with 1896:

COUNTIES.	1897.		1896.	
	Valuation.	Taxes.	Valuation.	Taxes.
Rockingham	$26,415,526	$469,159.11	$26,038,511	$458,212.46
Strafford	20,835,759	403,300.85	20,647,422	403,202.42
Belknap	9,167,414	180,692.27	9,538,828	189,772.49
Carroll	6,223,541	121,527.32	6,107,367	112,429.44
Merrimack	25,956,620	455,820.11	25,852,270	489,726 86
Hillsborough	60,659,440	1,197,324 34	59,233,847	1,098,727.20
Cheshire	17,881,722	267,064.31	17,836,526	267,156.84
Sullivan	8,641,508	171,822.15	8,622,457	164,218.85
Grafton	17,838,483	334,856.26	17,665,516	324,954 50
Coös	9,887,721	212,464.24	9,414,856	206,267.43
Total	$203,507,734	$3,814,030.96	$200,957,600	$3,714,668.49

In the county of Coös there is an additional valuation of $1,417,000 on unincorporated properties. This is subject to state and county taxes only. The state tax for 1897 is $2,475; county, $4,092.86; total, $6,567.86; rate, 46-100 of one per cent.

The increase in the inventories has been made almost wholly in the cities and large towns. The agricultural towns, in many cases, show a decrease.

The following table shows the valuation and taxes for the last thirteen years:

YEARS.	Valuation.	Taxes.	YEARS.	Valuation.	Taxes.
1885	$218,122,554	$3,035,878.10	1892	$266,427,500	$3,941,561.64
1886	222,106,281	3,140,512.23	1893	274,816,342	4,142,998.69
1887	228,234,851	3,147,790.01	1894	269,683,779	4,044,045.63
1888	235,998,455	3,577,212.60	1895 not tabula'd		
1889	241,766,633	3,588,353 51	1896	259,116,800	4,158,306.59
1890	250,530,530	3,749,413.32	1897	255,742,099	4,212,841.90
1891	259,191,770	3,841,310.63			

These valuations cover the inventories, savings-bank deposits, and insurance capital, and the taxes include the local assessments by cities and towns, and three fourths of one per cent on deposits, and one per cent on guaranty fund of savings banks, and one per cent on insurance capital of home companies.

The increase in the state valuation from 1885 ($218,122,554) to 1893 ($274,816,342), a period of eight years, was $56,693,788. Of this, $33,621,619 came from taxable savings-bank deposits, which had increased nearly eighty per cent; insurance capital, $1,675,000, none of which existed before; and the balance, $21,397,169, from the inventories. In 1893 the valuation reached its highest point ($274,816,242), and in the four subsequent years it has fallen to $255,742,099—a loss of $19,074,263. In this period, the taxable savings-bank deposits have decreased $26,164,917; the insurance capital, $300,000; while the inventories have increased $7,390,654.

The average rate per cent of taxation, including savings banks and insurance, on each $100 has been as follows: 1885, $1.49; 1886, $1.42; 1887, $1.38; 1888, $1.52; 1889, $1.52; 1890, $1.48; 1891, $1.50; 1892, $1.48; 1893, $1.50; 1894, $1.50; 1895, $1.52; 1896, $1.60; 1897, $1.64.

SAVINGS BANKS AND INSURANCE CAPITAL.

The savings-bank deposits taxable were in 1885, $43,402,663; in 1886, $46,974,722; in 1887, $50,361,325; in 1888, $53,902,934; in 1889, $57,738,572; in 1890, $63,846,977; in 1891, $69,834,914; in 1892, $73,098,-

476; in 1893, $77,024,282; in 1894, $70,569,236; in 1895, $63,977,001; in 1896, $56,884,200; in 1897, $50,859,365. Of this latter sum, $49,413,021 (deposits) was subject to three fourths per cent tax, and $1,446,344 (guaranty fund) to one per cent tax. The full amount of this tax for the year is $385,060.94.

The maximum of taxable deposits ($77,024,282) was reached in 1893. In the four years following they have decreased about seven millions each year, the total decrease being $26,164,917.

It is proper to state that the *taxable deposits*, above given, do not cover the *full deposits* of the savings banks. In 1893 the sum of $2,162,389.32, and in 1894 the sum of $3,169,790.90, was deducted under the state law exempting the banks on their real estate taxed locally, wherever it may exist, either within or without the state.

In 1895, under the act of the legislature of that year exempting all loans at five per cent made to parties living in the state, and secured by real estate within the limits of the state, the double exemption increased the amount for that year to $6,643,139.73; in 1896 the amount was further increased to $8,426,255.42; in 1897 the exemption reached the sum of $10,596,132.74.

These exemptions added to the taxable deposits will give the full deposits of their respective years. These were: 1893, $79,186,671.66; 1894, $73,708,854.35; 1895, $68,644,664.89; 1896, $63,435,283.47; 1897, $61,455,498.17. It will be observed that the largest deposit ever held by the savings banks of New Hampshire was in 1893, aggregating nearly eighty millions.

The insurance capital was, in 1888, $1,255,000; in 1889, $1,415,000; in 1890, $1,305,000; in 1891, $1,325,000; in 1892, $1,525,000; in 1893, $1,675,000; in 1894, 1895, and 1896, $1,275,000; in 1897, $1,375,000.

The tax on savings banks is paid to the state treasurer, and is all divided to the towns; amounts held by depositors within the state to towns covering the holdings, proportionately; on deposits without the state to the literary fund, also divided to the towns, proportionately to the number of scholars.

The tax on home stock insurance companies is paid to the state treasurer, and is divided as follows: On holdings of stock by residents in the state, three fourths to towns proportionately, and one fourth to the state; non-resident, all to the state. The amount received by the state goes to its revenue. The state also receives as revenue the entire tax of foreign companies.

VALUATION, TAXES, AND PER CENT IN CITIES AND LARGE TOWNS.

Subjoined is given the valuation, amount of taxes raised, and rate per cent of taxation on each $100, of the eleven cities and of the towns exceeding $1,000,000 valuation each:

CITIES.	Valuation.	Taxes.	Rate.
Berlin	$2,249,443	$55,112.37	$2 45
Franklin	2,540,285	46,995.27	1.85
Somersworth	3,106,479	62,129.51	2.00
Rochester	3,862,492	77,249.84	2.00
Laconia	4,350,208	88,406 56	2.03
Keene	6,484,194	96,434.73	1.49
Portsmouth	8,384,592	172,722.77	2.06
Dover	8,629,725	168,447.25	1.95
Concord	11,200,690	233,761.58	2.09
Nashua	13,812,211	292,818.52	2.12
Manchester	30,486,946	634,127.80	2.08
Total	$95,107.265	$1,928,206.22	

Average rate per cent, 2.03.

TOWNS.	Valuation.	Taxes.	Rate.
Lisbon	$1,133,412	$22,440.01	$1.98
Hanover	1,056,936	18,030.54	1.70
Wolfeborough	1,102,648	21,794.14	1.97
Hillsborough	1,121,216	25,356.76	2.35
Derry	1,213,092	22,527.52	1.86
Goffstown	1,186,190	15,505.47	1.31
Pittsfield	1,103,510	20,966.69	1.90
Rollinsford	1,183,144	17,296 95	1.46
Pembroke	1,205,244	17,476.40	1.45
Haverhill	1,190,481	24,524.49	2.71
Newmarket	1,304,962	26,099.24	2.00
Farmington	1,207,309	26,528 87	2.19
Lancaster	1,483,480	37,282.53	2.59
Winchester	1,276,663	21,185.17	1.66
Newport	1,408,930	33,625.21	2.39
Peterborough	1,385,857	30,488.85	2.20
Walpole	1,503,344	22,919.47	1.52
Littleton	1,649,938	43,151.76	2.61
Milford	1,975,525	39,510.50	2.00
Lebanon	2,455,492	45,592.85	1.85
Exeter	3,225,648	64,512.96	2.00
Claremont	3,191,733	67,026 39	2.10

Average rate per cent, 1.99 6-10.

Of the cities, Keene leads in its percentage of valuation compared with its population. It has, also, by far the lowest rate per cent of tax. It is proportionately the wealthiest, and is the most economically managed, city of the state.

Of the towns, Exeter has the largest per cent proportionate to population, and has taken the place of Claremont as leading the towns in its valuation.

It may be proper to add that in some cities, and towns also, the rate per cent in precincts, or school districts, is larger than that given above.

RATE PER CENT OF TAXATION BY COUNTIES—HIGHEST AND LOWEST.

The average rate per cent of taxation returned by inventories and shown by counties is as follows:

Rockingham, $1.78.—Highest, Seabrook, $2.18; lowest, Brentwood and North Hampton, each $1.10.

Strafford, $1.94.—Highest, Barrington, $2.90; lowest, Durham, $1.17.

Belknap, $1.97.—Highest, Meredith, $2.53; lowest, Center Harbor, $1.28.

Carroll, $1.95.—Highest, Albany, $3.31; lowest, Jackson, $1.61. (Hart's Location, $0.70.)

Merrimack, $1.76.—Highest, Concord, $2.09; lowest, Bradford, $0.74.

Hillsborough, $1.97.—Highest, Hillsborough, $2.35; lowest, Greenville, $1.10.

Cheshire, $1.50.—Highest, Troy, $1.94; lowest, Dublin, $1.07.

Sullivan, $1.99.—Highest, Springfield, $2.70; lowest, Langdon, $1.25.

Grafton, $1.88.—Highest, Thornton, $2.96; lowest, Grafton, $1.25. (Waterville, $0.37.)

Coös, $2.15.—Highest, Gorham, $2.60; lowest, Errol, $1.40.

The two small towns, Hart's Location and Waterville, with lowest rates per cent, can hardly be considered as competitive with other towns, and therefore are not entered for such purpose.

Entire state, by inventories ($203,507,734), $1.87 4-10; including Coös unincorporated properties ($1,417,000), savings-banks deposits taxable ($50,859,365), and insurance capital taxable ($1,375,000), $1.64 1-10.

The highest per cent in the state ($3.31) is in the little town of Albany, Carroll county, and the lowest ($0.74) in Bradford, Merrimack county.

Of the $203,507,734 valuation of the entire state, as returned by inventories, the eleven cities aggregate the sum of $95,107,265, or nearly one half of the whole.

The entire sum of taxation of the state for 1897 is as follows:

Taxes in cities and towns (inventories)	$3,814,030.96
" by state, savings-banks	385,060.94
" " insurance	13,750 00
" " railroads	351,092.63
" " telegraphs	3,330.84
" " telephones	3,503.04
Total	$4,570,768.41

The state tax of $500,000, which has been the annual levy since 1888, was reduced by an act of the last legislature to $425,000. It will not be operative till 1898, as the state treasurer had issued his warrants for the tax of 1897, to the towns, on the old basis, before the act was passed. It will, however, lessen the payment of each city and town and unincorporated place, fifteen per cent for the next two years.

VALUATION AND ASSESSMENT OF RAILROAD CORPORATIONS FOR 1897.

Names of Roads.	Valuation.	Amount in towns.	Value for taxation.	Tax.
Boston & Lowell	$60,000	$9,150	$50,850	$833.94
Boston & Maine	3,370,000	84,640	3,285,360	53,879 90
Concord & Claremont	600,000	3,900	596,100	9,776.04
Concord & Montreal	6,560,000	136,535	6,423,465	105,344.82
Concord & Portsmouth	600,000	.....	600,000	9,840.00
Connecticut River	225,000	14,450	210,550	3,453 02
Eastern	425,000	75,266	349,734	5,735.63
Fitchburg	1,635,000	26,126	1,608,874	26,385.53
Grand Trunk	400,000	11,900	388,100	6,364.84
Manchester & Lawrence	1,500,000	3,296	1,496,704	24,545.94
Manchester & North Weare	80,000	.....	80,000	1,312.00
Mount Washington	150,000	.....	150,000	2,460.00
Nashua, Acton & Boston	20,000	2,000	18,000	295.20
Nashua & Lowell	400,000	27,700	372,300	6,105.72
Northern	2,250,000	11,300	2,238,700	36,714.68
Pemigewasset Valley	160,000	.....	160,000	2,624.00
Peterborough	50,000	800	49,200	806.88
Peterborough & Hillsborough	70,000	.....	70,000	1,148.00
Portsmouth & Dover	100,000	.....	100,000	1,640.00
Portland & Ogdensburg	300,000	500	299,500	4,911.80
Portland & Rochester	30,000	3,000	27,000	442.80
Profile & Franconia Notch	100,000	.....	100,000	1,640.00
Sullivan County	700,000	.....	700,000	11,480.00
Suncook Valley	140,000	4,600	135,400	2,220.56
Whitefield & Jefferson	125,000	.....	125,000	2,050.00
Wilton	250,000	2,150	247,850	4,064.74
Worcester, Nashua & Rochester	1,200,000	13,900	1,186,100	19,452.04
Concord Street Railway	45,000	600	44,400	728.16
Laconia Street Railway	35,000	10,598	24,402	400.19
Manchester Street Railway	225,000	2,000	223,000	3,657.20
Nashua Street Railway	50,000	2,500	47,500	779.00
Total	$21,855,000	$446,911	$21,408,089	$351,092.63

A deduction has been made from the valuations, of all sums assessed in towns and paid by the railroads upon their property not required for general use in the running of the roads. The amount thus obtained has been assessed at the average rate of property taxation throughout the state, to wit: $1.64 upon each $100 of taxable property. This rate has been gradually increasing. The rate in 1896 was $1.60; in 1895, $1.52; in 1894, $1.50. In 1887, ten years ago, it was $1.38.

The railroad tax is $351,092.63, against $332,039.11 for 1896; telegraph tax, $3,330.84, against $3,190.40 for 1896; telephone tax, $3,503.04, against $3,129.60 for 1896; total, $357,926.51, against $338,359.11 for 1896, an increase of $19,567.40.

The railroad tax is paid by the corporations to the state treasurer, and divided as follows: One entire fourth part to towns through which the roads pass, for right of way and buildings, proportioned to expenditure for the same; the other three fourths to each town in the state, such portion thereof as the number of shares owned in said town bears to the whole number of shares in the corporation; and the balance of the said three fourths (non-resident) directly to the state, and is a part of its revenue.

The telegraph and telephone tax is paid to the state treasurer and not divided, but held by the state as part of its revenue.

The expense of the railroad commission is met by a tax levied on gross receipts of the railroads. Its amount is $7,437.97, against $7,436.40 for 1896.

The amount of tax assessed upon the railroad, telegraph, and telephone properties in this state since the formation of the Board of Equalization has been annually as follows: 1879, $215,094.72; 1880, $176,192.44; 1881, $185,109.85; 1882, $170,871.58; 1883, $194,757.97; 1884, $206,688.69; 1885, $194,358.47; 1886, $213,337.27; 1887, $220,538.70; 1888, $242,994.79; 1889, $246,186.32; 1890, $272,500.02; 1891, $287,849.31; 1892, $306,661.30; 1893, $312,920.15; 1894, $315,313.91; 1895, $320,382.38; 1896, $338,359.11; 1897, $357,926.51.

VALUATION AND ASSESSMENT OF TELEGRAPHS, 1897.

Names.	Valuation.	Tax.
American	$2,000	$32.80
Chester & Derry	100	1.64
Great Northwestern	6,000	98.40
Maine	10,000	164.00
Direct U. S. Cable	10,000	164.00
Postal Telegraph Cable	15,000	246.00
Western Union	160,000	2,624.00
	$203,100	$3,330.84

VALUATION AND ASSESSMENT OF TELEPHONES, 1897.

Names.	Valuation.	Tax.
Colebrook, Stewartstown & Connecticut Lake	$600	$9.84
New England Telephone & Telegraph	200,000	3,280.00
Northern	8,000	131.20
Plymouth & Campton	3,000	49.20
Citizens of Laconia	2,000	32.80
	$213,600	$3,503.04

APPORTIONMENT OF SALARIES AND EXPENSES OF RAILROAD COMMISSIONERS FOR YEAR ENDING JUNE 1, 1897.

Names.	Gross receipts.	Proportion of expenses.
Boston & Maine	$5,095,000	$5,656.19
Fitchburg	600,000	666.09
Grand Trunk	310,000	344.14
Mount Washington	20,000	22.20
Portland & Ogdensburg	150,000	166.52
Portland & Rochester	15,000	16.65
Sullivan County	244,000	270.88
Concord Street	49,000	54.40
Laconia Street	11,000	12.21
Manchester Street	145,000	160.97
Nashua Street	61,000	67.72
	$6,700,000	$7,437.97

Proportion of other roads included in Boston & Maine.

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

ROCKINGHAM COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Atkinson	136	$13,600	...	.....	1	$10	13	$870	.....	.....	.....
Auburn	178	17,800	....	.....	1	5	2	175	.....	.....	.....
Brentwood	183	18,300	....	.....	28	270	2	125	.....	$400	.....
Candia	282	28,200	....	.....	....	.....	15	750	.....	800	.....
Chester	211	21,100	....	.....	....	.....	1	70	$4,983	.....	.....
Danville	154	15,400	....	.....	....	.....	3	250	.....	.....	.....
Deerfield	329	32,900	....	.....	5	60	2	134	.....	3,500	.....
Derry	720	72,000	....	.....	9	39	31	3,175	.....	21,275	$18,000
East Kingston	132	13,200	....	.....	2	12	4	315	.....	400	.....
Epping	376	37,600	....	.....	9	50	19	1,235	.....	16,100	.....
Exeter	1,154	115,400	....	.....	8	80	100	9,595	2,800	31,770	.....
Fremont	141	14,100	....	.....	....	.....	3	150	.....	300	.....
Greenland	153	15,300	....	.....	....	.....	16	950	4,000	23,083	.....
Hampstead	243	24,300	....	.....	....	.....	20	1,270	.....	4,500	5,000
Hampton	296	29,600	....	.....	....	.....	13	930	.....	2,300	.....
Hampton Falls	156	15,600	....	.....	11	75	29	1,980	2,000	500	.....
Kensington	140	14,000	....	.....	1	8	4	250	.....	1,600	.....
Kingston	284	28,400	....	.....	....	.....	4	295	.....	1,054	.....
Londonderry	344	34,400	....	.....	....	.....	13	900	.....	15,600	.....
Newcastle	139	13,900	....	.....	....	.....	63	5,400	.....	5,750	.....
Newfields	147	14,700	....	.....	....	.....	7	400	.....	7,266	.....
Newington	91	9,100	....	.....	....	.....	1	50	.....	3,466	.....
Newmarket	548	54,800	....	.....	15	184	30	2,136	.....	24,200	.....
Newton	271	27,100	....	.....	....	.....	7	385	.....	.....	.....
North Hampton	207	20,700	....	.....	38	172	41	3,195	300	4,200	.....
Northwood	326	32,600	2	$50	....	... ...	20	1,225	.....	6,736	.....
Nottingham	238	23,800	....	.....	....	.....	....	.....	.....	2,300	.....
Plaistow	255	25,500	....	.. ...	3	30	15	954	.....	200	.....
Portsmouth	2,650	265,000	1	50	98	560	313	41,705	132,678	617,090	.....
Raymond	360	36,000	....	.....	....	.....	....	.....	.....	.....	.....
Rye	276	27,600	....	.....	5	41	69	5,232	.....	5,433	.....
Salem	430	43,000	....	.....	11	100	30	1,520	.....	1,000	.....
Sandown	114	11,400	....	.....	....	.....	3	150	.....	1,500	.....
Seabrook	429	42,900	....	.....	3	18	3	210	.....	.....	.....
South Hampton	79	7,900	....	.....	....	.....	12	720	.....	.....	.....
Stratham	144	14,400	2	20	...	.....	8	400	100	3,419	10,500
Windham	162	16,200	...	.....	6	35	7	535	....	100	....
Totals	12,478	$1,247,800	5	$120	254	$1,749	923	$87,636	$146,861	$805,842	$33,500

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

ROCKINGHAM COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and theirmachinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$35,382	$10,075	$600	$241,090	$320,402	$3,588.50	1.12
.....	5,575	8,035	3,375	249,204	301,500	4,582.80	1.52
.....	15,050	10,850	16,620	212,674	298,489	3,283.32	1.10
....	1,500	5,850	400	278,300	339,618	5,433 86	1.60
.....	5,675	5,985	3,583	301,140	363,661	5,636.75	1.55
.....	.....	13,704	2,500	155,202	197,408	3,158.53	1.60
.....	6,850	21,232	4,400	296,779	403,436	6,858.41	1.70
.....	.....	80,167	32,350	947,105	1,213,092	22,527.52	1.86
.....	.....	28,900	4,800	172,669	237,537	2,802.93	1.18
.....	2,250	72,925	17,500	535,205	710,790	12,463.27	1.75
.....	*366,601	198,300	....	2,452,582	3,225,648	64,512.96	2.00
.....	.....	37,950	9,600	189,375	265,500	3,000.15	1.13
.....	3,850	450	1,100	292,135	368,342	4,604.27	1.25
.....	10,100	26,175	6,200	292,163	389,109	5,068.39	1 30
.....	8,950	9,650	1,500	579,300	654,941	8,577.37	1.31
.....	4,200	4,400	2,335	238,401	289,497	3,763.46	1.30
.....	2,289	2,865	200	210,152	251,593	2,817 84	1.12
.....	8,350	8,970	2,200	272,969	336,990	5,898.06	1.75
... .	20,595	14,550	7,450	420,552	553,950	7,201.35	1.30
.....	... .	2,580	.....	232,612	265,914	4,463.08	1.67
.....	3,100	5,500	800	213,144	253,124	3,961.95	1.56
$3,500	1,900	625	500	187,710	225,845	2,936.14	1.30
.....	29,670	105,300	389,810	665,500	1,304,962	26,099.24	2.00
.....	725	.....	6,600	330,145	377,769	6,422.07	1.70
.....	3,560	4,100	3,300	539,357	607,518	6,698.12	1.10
.....	13,698	27,910	6,900	377,465	495,859	8,913.35	1.80
.....	4,225	22,190	.....	244,100	319,444	5,428.72	1.69
.....	850	17,250	4,000	277,158	339,844	5,096.66	1.50
.....	177,940	530,888	.....	6,501,279	8,384,592	172,722.77	2.06
....	900	33,526	4,000	320,054	418,586	7,326.24	1.75
.....	.....	2,326	400	525,941	600,267	7,668.00	1.28
.....	24,000	27,620	15,950	548,742	699,526	15,109.76	2 16
.....	.....	2,800	3,010	127,245	155,309	2,329.66	1.50
.....	900	3,175	.....	238,137	294,864	6,419.49	2.18
.....	1,475	4,290	1,100	170,570	195,444	2,540.77	1.30
.....	26,114	3,950	3,027	329,656	416,277	5,176.81	1.24
.....	2,200	11,860	10,275	277,393	338,879	4,066.54	1.20
$3,500	$788,414	$1,366,923	$566,185	$20,443,205	$26,415,526	$469,159.11	

* Doomage, $300,300.

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

STRAFFORD COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Barrington	300	$30,000	....	.....	2	$22	....	.....	.....	$7,082	.....
Dover	3,122	312,200	....	.....	23	244	123	$12,520	.....	166,134	.....
Durham	251	25,100	....	.....	4	25	10	600	$34,144	23,300	$300
Farmington	757	75,700	....	.....	....	.....	52	4,270	500	17,046	.....
Lee	166	16,600	....	.....	....	.....	5	400	.....	5,900	.....
Madbury	96	9,600	....	.....	....	.....	6	350	.....	9,963	.....
Middleton	78	7,800	....	.....	....	.....	....	.....	.....	.....	.....
Milton	447	44,700	....	.....	....	.....	7	400	.....	2,088	.....
New Durham	167	16,700	2	$30	....	.....	2	100	.....	.....	.....
Rochester	2,260	226,000	3	110	....	.....	85	6,840	2,000	86,080	.....
Rollinsford	425	42,500	....	.....	....	.....	10	575	.....	46,964	.....
Somersworth	1,530	153,000	....	.....	....	.....	82	6,310	.....	189 587	.....
Strafford	303	30,300	....	.....	....	.....	3	150	.....	3,120	.....
Totals	9,902	$990,200	5	$140	29	$291	385	$32,515	$36,644	$559,264	$300

BELKNAP COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Alton	411	$41,100	....	.....	....	.....	15	$1,030	$1,000	$3,400	.....
Barnstead	304	30,400	....	.....	....	.....	8	648	.....	945	.....
Belmont	312	31,200	....	.....	....	.....	6	310	500	8,200	$2,900
Center Harbor	133	13,300	....	.....	....	.....	25	1,938	.....	700	.....
Gilford	213	21,300	....	.....	2	$14	....	.....	.....	3,750	.....
Gilmanton	321	32,100	....	.....	....	.....	2	100	.....	6,200	.....
Laconia	2,220	222,000	....	.....	3	20	74	4,868	.....	118,378	.....
Meredith	450	45,000	....	.....	2	16	11	870	.....	5,026	.....
New Hampton	241	24,100	....	.....	41	350	1	65	.....	300	1,600
Sanbornton	279	27,900	....	.....	3	28	1	60	.....	900	.....
Tilton	446	44,600	....	.....	....	.....	17	3,265	2,200	41,119	.....
Totals	5,330	$533,000	....	.....	51	$428	160	$13,154	$3,700	$188,918	$4,500

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

STRAFFORD COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$3,658	$27,620	$6,200	$326,353	$432,418	$12,540.12	2.90
.....	108,458	1,010,092	1,158,300	5,627,108	8,629,725	168,447.25	1.95
.....	6,460	16,400	2,100	426,283	565,050	6,682.12	1.17
.....	63,334	52,250	4,600	944,842	1,207,369	26,528.87	2.19
$250	20,358	14,350	3,900	208,200	295,224	4,487 41	1.52
.....	16,928	1,350	700	164,998	220,620	2,986.49	1.35
....	.....	2,330	.....	74,555	91,860	2,020.92	2.20
.....	19,850	17,410	33,300	445,445	590,287	9,709.86	1.64
.....	1,500	13,615	8,750	148,045	203,378	4,275.15	2.10
....	32,916	411,644	316,700	2,688,012	3,862,492	77,249.84	2.00
.....	33,080	60,733	404,334	567,873	1,183,144	17,296 95	1.46
.....	5,140	237,402	920,000	1,509,154	3,106,479	62,129.51	2.00
.....	2,375	5,250	2,200	358,752	447,773	8,946.46	2.00
$250	$314,057	$1,870,446	$2,861,084	$13,549,600	$20,835,759	$403,300.85	

BELKNAP COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
....	$1,560	$17,150	$9,050	$490,202	$604,910	$12,703.11	2.10
.....	8,320	15,175	4,350	385,906	486,187	7,679.85	1.58
.....	13,736	19,953	25,950	361,500	496,600	9,932.00	2.00
.....	12,803	10,200	.....	184,938	238,358	3,050 63	1.28
....	6,210	1,270	.....	310,202	370,050	6,418.62	1.78
.....	4,175	8,750	6,306	363,448	464,074	9,281.48	2.00
.....	56,298	285,884	336,830	3,281,222	4,350,208	88,466 56	2 03
.....	17,435	31,775	11,656	456,854	605,553	15,307.27	2 53
.....	18,068	14,540	2,560	235,489	325,400	5,470 07	1.68
.....	12,560	5,510	976	273,500	361,750	6,005.05	1 66
.....	43,995	68,555	57,560	578,160	864,324	16,437.63	1.90
.....	$195,090	$478,762	$455,118	$6,924,421	$9,167,414	$180,692.27	

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

CARROLL COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No	Val.	No.	Val.			
Albany	66	$6,600									
Bartlett	448	44,800			3	$24	19	$1,648			
Brookfield	91	9,100			5	38				$800	
Chatham	78	7,800									
Conway	767	76,700			16	96	55	3,914		1,000	
Eaton	114	11,400			2	10					
Effingham	170	17,000	4	$50	1	10	4	225		400	
Freedom	190	19,000					4	225		3,000	
Hart's Location	25	2,500									
Jackson	166	16,600			2	30	54	4,424			
Madison	148	14,800					4	260			
Moultonborough	295	29,500			1	5	5	300		300	$5,700
Ossipee*											
Sandwich	324	32,400					9	538			
Tamworth	276	27,600					17	250			
Tuftonborough	178	17,800								100	
Wakefield	436	43,600					15	900		3,500	
Wolfeborough	610	61,000	2	80			33	2,006		3,900	
Totals	4,382	$438,200	6	$130	30	$213	219	$14,690		$13,000	$5,700

* No inventory returned.

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

CARROLL COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and theirmachinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	.....	.....	$3,700	$56,514	$70,720	$2,341.21	3.31
.....	$8,935	$40,100	26,700	291,019	427,085	8,920.01	2.09
.....	1,449	280	.....	91,388	114,288	2,468.38	2.16
.....	.....	.....	1,500	68,664	85,319	1,747.52	2.05
$150	11,012	66,388	.....	682,742	879,020	18,695.10	2.07
.....	1,232	4,020	1,400	92,568	122,166	2,157.24	1.76
72	1,486	4,675	.....	168,960	209,098	4,558.34	2.18
.....	1,850	5,800	1,400	192,650	241,536	4,347.85	1.80
.....	1,500	3,000	4,000	17,200	28,555	199.88	.70
.....	5,750	4,490	2,400	222,600	278,139	4,836.85	1.61
.....	4,544	3,680	800	123,646	157,132	3,079.97	1.96
.....	3,050	23,563	500	255,232	340,132	5,950.57	1.75
....	.....	.....	.....	.....	*493,468	9,129.16	1.85
.....	9,326	10,210	.....	341,276	441,374	9,491.99	2.15
.....	13,150	17,322	3,800	273,952	366,614	7,185.45	1.96
.....	1,700	2,900	4,000	202,488	251,005	4,593 45	1.83
.....	35,034	37,280	16,600	449,602	615,342	10,030.21	1.63
.....	7,560	50,026	12,700	912,275	1,102,648	21,794.14	1.97
$222	$107,578	$273,734	$79,500	$4,442,776	$6,223,541	$121,527.32	

* Taken from financial statement to state treasurer.

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

MERRIMACK COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Allenstown	315	$31,500	....	.....	4	$28	4	$250	.....	.....	.....
Andover	310	31,000	....	.....	3	30	9	581	.....	$13,300	.....
Boscawen	281	28,100	....	.....	1	15	4	400	$4,350	2,400	.....
Bow	217	21,700	....	.....	....	.....	....	.....	.....	5,400	$1,700
Bradford	247	24,700	....	.....	1	10	10	537	4,500	1,600	.....
Canterbury	235	23,500	2	$75	....	.....	....	.....	.....	200	.....
Chichester	179	17,900	....	.....	....	.....	....	.....	25,850	16,726	.....
Concord	4,812	481,200	....	.....	68	460	398	29,485	.....	300,609	40,550
Danbury	169	16,900	....	.....	....	.....	1	50	.....	.....	.....
Dunbarton	162	16,200	....	.....	6	35	....	.....	.....	1,423	.....
Epsom	228	22,800	1	20	3	28	13	650	.....	3,400	.....
Franklin	1,173	117,300	....	.....	....	.....	36	2,975	.....	45,873	.....
Henniker	361	36,100	....	.....	5	52	20	1,260	3,500	2,700	350
Hill	169	16,900	....	.....	2	24	....	.....	.....	1,000	.....
Hooksett	358	35,8 0	2	200	1	15	13	1,045	.....	5,638	.....
Hopkinton	427	42,700	....	.....	23	224	26	1,817	1,000	12,977	13,995
London	314	31,400	...	.....	8	58	9	650	.....	3,200	.....
Newbury	120	12,000	....	.....	2	16	7	290	... .	2,900	.....
New London	212	21,200	....	.....	4	35	25	1,700	3,100	1,050	1,000
Northfield	254	25,400	....	.....	1	6	11	800	.....	2,354	.....
Pembroke	799	79,900	3	90	9	66	47	2,550	13,500	16,954	.....
Pittsfield	503	50,300	2	135	13	65	42	2,535	200	6,615	500
Salisbury	179	17,900	....	.....	....	.....	....	.....	.....	400	.....
Sutton	223	22,300	...	.....	14	137	7	420	.....	1,200	250
Warner	369	36,900	1	10	9	60	20	1,398	500	8,450	835
Webster	139	13,900	....	.....	11	110	1	50	500	.....	1,080
Wilmot	191	19,100	1	20	1	10	....	.....	.....	.....	.....
Totals	12,946	$1,294,600	12	$550	189	$1,484	703	$49,443	$57,000	$456,369	$60,180

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

MERRIMACK COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$11,000	$49,760	$238,000	$301,404	$641,212	$6,734.64	1.05
.....	15,075	36,508	13,550	365,808	447,056	6,884.66	1.54
.....	4,615	48,650	47,000	439,855	596,624	11,228.00	1.88
.....	18,961	8,850	43,826	278,116	401,930	4,019.30	1.00
.....	24,732	23,281	7,096	294,209	413,496	3,072.44	.74
.....	4,343	10,936	1,500	362,753	434,419	5,304.33	1 22
.....	2,217	7,410	1,040	209,245	282,616	3,300.00	1.18
.....	202,668	666,048	69,402	9,278,174	11,200,690	233,761.58	2.09
.....	7,856	6,450	2,950	156,396	202 726	3,296.17	1.55
.....	10,682	7,320	.....	244,175	307,096	3,623 98	1.18
....	1,200	15,186	5,580	250,500	333,000	5,161.53	1.55
$500	32,962	230,270	574,150	1,489,543	2,540,285	46,995.27	1.85
.....	18,220	28,732	32,950	522,927	693,079	12,475.41	1.80
....	7,719	10,950	6,000	134,066	192,650	2,889.75	1.50
.....	3,025	19,460	117,760	484,234	700,434	10,931.47	1.56
.....	40,109	23,200	20,650	637,143	850,410	10,204.92	1.20
.....	10,927	2,100	3,075	391,446	484,617	6,792.40	1.40
.....	10,685	4,090	2,100	227,801	277,816	3,530.95	1.27
28	39,413	10,230	.....	269,550	378,490	5,677.35	1.50
.....	7,775	14,980	32,500	427,014	532,256	6,757.66	1.27
.....	25,200	76,300	229 200	726,804	1,205,244	17,476.40	1.45
.....	10,120	70,040	61,100	857,980	1,103,510	20,966.69	1.90
.....	7,950	3,500	5,570	204,499	263,173	4,526.46	1.72
....	13,707	15,685	2,550	244,379	329,569	4,679 88	1.42
.....	34,853	29,713	600	492,664	648,573	8,775.21	1.35
....	17,982	5,150	2,650	203,860	268,492	2,956.41	1.10
....	6,470	15,850	4,500	150,342	217,157	3,800.25	1.75
$528	$590,466	$1,440,669	$1,527,299	$19,584,827	$25,956,620	$455,820.11	

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

HILLSBOROUGH COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Amherst	251	$25,100	2	$60	....	.....	32	$2,123	$1,500	$7,600	.....
Antrim	406	40,600	.....	.....	5	$34	34	1,825	.....	12,735	.....
Bedford	289	28,900	1	20	4	28	7	400	.....	1,000	.....
Bennington	175	17,500	.....	.....	2	12	7	350	.....	1,078	.....
Brookline	182	18,200	.....	.....	.....	.....	8	440	.....	720	.....
Deering	142	14,200	.....	.....	.....	.....	....	.....	.....	2,500	.....
Francestown	192	19,200	.....	.....	....	.....	17	1,134	500	1,000	.....
Goffstown	528	52,800	....	.....	44	488	20	1,516	17,000	9,145	.....
Greenfield	159	15,900	1	25	1	10	12	625	.....	.....	.....
Greenville	338	33,800	.....	.....	.....	.....	22	1,616	.....	.....	.....
Hancock	190	19,000	.....	.....	.....	.....	5	315	.....	13,794	.....
Hillsborough	650	65,000	....	.....	4	26	22	1,420	.....	14,864	.....
Hollis	248	24,800	2	120	....	.....	17	1,040	.....	18,478	.....
Hudson	282	28,200	.....	.....	2	30	10	660	.....	8,400	.....
Litchfield	74	7,400	.....	.....	.....	.....	6	300	.....	17,400	$300
Lyndeborough	169	16,900	.....	.....	5	38	....	.....	.....	3,700	.....
Manchester	12,921	1,292,100	....	.....	45	470	....	57,810	.....	233,264	.....
Mason	163	16,300	.....	.....	.....	.....	4	400	.....	.....	.....
Merrimack	285	28,500	.....	.....	.....	.....	7	350	.....	9,232	.....
Milford	962	96,200	1	25	4	60	48	3,533	.....	59,686	.....
Mont Vernon	120	12,000	.....	.....	.....	.....	14	950	.....	400	.....
Nashua	5,830	583,000	....	.....	10	86	....	21,848	36,936	198,900	2,000
New Boston	264	26,400	....	.....	75	900	9	550	.....	1,000	3,100
New Ipswich	219	21,900	.....	.....	.....	.....	7	590	.....	.....	.....
Pelham	212	21,200	....	.....	16	160	15	855	.....	3,000	.....
Peterborough	588	58,800	....	.....	....	.....	28	2,175	6,600	60,004	500
Sharon	28	2,800	.....	.....	....	.....	....	.....	.....	.....	....
Temple	83	8,300	....	.....	....	.....	....	.....	.....	1,100	.....
Weare	358	35,800	....	.....	5	36	15	795	500	2,500	.....
Wilton	440	44,000	1	20	21	210	43	3,085	1,300	7,100	155
Windsor	9	900	.....	.....	....	.....	....	.....	.....	.....	.....
Total	26,767	$2,676,700	8	$270	243	$2,588	409	$106,705	$64,336	$688,600	$6,055

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

HILLSBOROUGH COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and theirmachinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$13,006	$7,640	$9,850	$504,800	$616,980	$10,769.22	1.75
.....	29,996	57,450	35,500	402,750	615,702	12,314.04	2.00
.....	78,757	7,100	1,400	488,010	651,042	7,291.67	1.12
.....	2,930	18,451	42,100	144,747	237,904	4,639 38	1.95
.....	4,620	10,740	16,470	247,744	310,758	5,096 42	1.64
$200	3,767	6,825	1,750	153,565	207,873	4,331.50	1.61
.....	23,176	26,100	7,275	276,450	384,608	5,639.64	1.40
.....	81,714	42,105	26,250	900,631	1,186,190	15,505.47	1.31
.....	6,376	26,640	3,250	189,857	263,402	4,883.79	1.85
.....	19,388	83,450	233,550	305,935	689,325	7,582.57	1.10
.....	3,775	6,700	3,200	247,880	323,336	5,270.37	1.63
.....	14,200	84,726	63,900	823,390	1,121,216	25,356.76	2.35
.....	23,038	12,690	9,100	473,845	604,118	9,061.77	1.50
.....	19,000	14,450	600	560,488	662,114	9,931.71	1.50
.....	11,310	19,665	200	163,530	230,601	2,657.71	1.15
.....	6,350	5,206	1,690	217,876	277,840	4,167.60	1.50
.....	113,288	2,772,150	7,068,650	18,763,182	30,486,946	634,127.80	2.08
.....	25,718	10,800	1,000	230,712	301,761	3,470.66	1.15
.....	6,360	21,600	81,540	419,435	594,997	7,442.68	1.25
.....	83,628	142,250	134,400	1,406,130	1,975,525	39,510.50	2.00
.....	9,500	6,150	2,200	250,962	297,070	4,100.14	1.38
.....	239,323	982,436	3,072,620	8,589,143	13,812,211	292,818.52	2.12
.....	43,248	24,135	7,750	436,035	589,394	9,053.29	1.53
.....	900	8,002	99,700	336,338	487,996	7,661.94	1.57
.....	23,770	11,616	7,700	366,489	473,981	5,831.46	1.23
.....	97,466	89,875	118,100	910,489	1,385,857	30,488.85	2.20
.....	300	200	2,200	54,160	62,654	1,178.48	1.88
.....	4,110	1,450	.....	134,198	165,698	2,972.14	1.80
.....	19,296	38,185	7,130	497,750	664,859	9,859.91	1.48
.....	46,343	58,635	50,350	702,610	950,000	15,200.00	1.60
.....	.....	.....	.....	25,053	27,482	388.35	1.41
$200	$1,054,653	$4,597,422	$11,109,405	$39,220,684	$60,659,440	$1,197,324.34	

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

CHESHIRE COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No	Val.	No.	Val.			
Alstead	218	$21,800			5	$40	22	$1,965		$20,149	
Chesterfield	268	28,600			2	12	2	120	$11,582	5,200	
Dublin	127	12,700			5	50	53	5,335		9,884	$4,255
Fitzwilliam	264	26,400					13	858		3,796	
Gilsum	159	15,900	2	$75	1	12			1,000	6,982	1,125
Harrisville	223	22,300					26	1,580		1,364	
Hinsdale	527	52,700	2	160	14	76	7	385		2,500	
Jaffrey	356	35,600	1	16	2	20	36	2,674	2,000	48,216	
Keene	2,173	217,300			19	160	93	8,448		115,300	
Marlborough	429	42,900					16	1,210		23,580	
Marlow	140	14,000			1	10	3	200	3,900	27,312	1,220
Nelson	72	7,200								500	
Richmond	130	13,000								300	
Rindge	193	19,300			3	28	16	1,185		8,138	
Roxbury	35	3,500			3	17		150			
Stoddard	94	9,400	8	160	1	12	3	180		3,413	
Sullivan	70	7,000								9,264	
Surry	67	6,700			1	10	5	305			
Swanzey	428	42,800					28	1,930		2,536	
Troy	261	26,100					9	530	500	533	
Walpole*											
Westmoreland	239	23,900			6	60			1,000	6,993	
Winchester	620	62,000					9	620		49,541	
Totals	7,093	$709,300	13	$411	63	$507	341	$27,675	$19,982	$345,501	$6,600

*No inventory returned.

CHESHIRE COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$27,886	$19,350	$14,740	$352,445	$494,577	$6,726.29	1.36
.....	11,046	10,890	10,975	502,795	616,549	7,145.12	1.15
.....	47,420	6,200	1,750	429,150	539,273	5,770.42	1.07
$7,120	25,189	19,380	12,600	358,662	477,597	8,357.95	1.75
.....	28,785	8,884	29,300	168,111	276,394	3,316.70	1.20
.....	7,187	33,490	48,100	202,470	331,724	5,308.13	1.60
.....	10,900	82,175	104,425	701,527	985,084	18,224.22	1.85
.....	*86,108	54,102	66,100	573,620	903,574	11,296.75	1.25
.....	310,800	490,700	40,000	5,202,561	6,484,194	96,434.73	1.49
.....	40,062	31,090	38,850	463,652	665,784	10,320.12	1.55
.....	44,610	7,310	4,700	154,736	279,052	3,906.73	1.40
.....	3,260	1,598	5,150	101,764	128,123	1,854.53	1.43
.....	2,145	23,198	8,025	152,165	214,145	3,640 46	1.70
.....	28,557	12,840	.....	398,785	492,670	6,095.19	1.24
.....	1,086	100	.....	59,151	67,415	1,065 16	1.58
.....	8 0	5,890	11,400	126,264	169,417	2,745.72	1.62
.....	2,881	1,080	4,850	82,550	120,745	2,208.74	1.83
.....	13,655	625	2,000	115,225	153,524	1,765.52	1.15
.....	28,768	36,650	51,050	541,950	738,462	10,338.47	1.40
.....	16,937	35,725	71,725	340,905	508,115	9,856 92	1.94
.....	.....	.....	.....	.....	†1,503,344	22,919.47	1.52
.....	24,495	4,550	2,450	336,995	455,297	6,601.80	1.45
.....	33,535	106,590	105,450	867,267	1,276,663	21,185.17	1.66
$7,120	$796,106	$992,417	$633,640	$12,232,750	$17,881,722	$267,064.31	

* Doomage, $22,526. † Taken from financial statement to state treasurer.

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

GRAFTON COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Alexandria	189	$18,900			1	$10	16	$964			
Ashland	350	35,000					14	1,054		$11,354	
Bath	286	28,600			20	148				7,198	
Benton	53	5,300									
Bethlehem	328	32,800	7	$180	27	400		7,400		1,200	
Bridgewater	82	8,200			1	8					
Bristol	431	43,100					21	1,080		10,796	
Campton	301	30,100	1	14			11	670		3,416	
Canaan	366	36,600			9	53				1,300	
Dorchester	97	9,700									
Easton	97	9,700								800	
Ellsworth	32	3,200									
Enfield	430	43,000					12	780	$2,000	9,600	
Franconia	168	16,800	2	25				3,300		5,900	
Grafton	200	20,000			6	47				1,000	
Groton	100	10,000									
Hanover	465	46,500			15	90	28	1,714	500	49,730	$5,150
Haverhill	845	84,500			14	84	6	300	1,000	8,200	4,500
Hebron	68	6,800									
Holderness	183	18,300	1	10			17	1,050			
Landaff	149	14,900			1	8	2	110		3,000	
Lebanon	1,207	120,700			7	74	26	1,988	56,624	75,518	2,200
Lincoln	594	59,400			3	30					
Lisbon	565	56,500			12	100	43	3,669			
Littleton	853	85,300			7	35	25	2,010		105,619	
Livermore	73	7,300			8	40					
Lyman	150	15,000								300	
Lyme	300	30,000	3	65	3	19	4	225			
Monroe	149	14,900	1	50	4	22				1,300	
Orange	60	6,000			4	32					
Orford	241	24,100	2	100	2	12	10	575	500	600	
Piermont	209	20,900			10	100					
Plymouth	496	49,600			7	82	36	2,780		37,440	
Rumney	257	25,700					9	450		1,000	
Thornton	156	15,600									
Warren	251	25,100			22	82	9	620			
Waterville	14	1,400					4	200			
Wentworth	204	20,400			1	8	2	150	500		
Woodstock	146	14,600					16	1,150		2,000	
Totals	11,145	$1,114,500	17	$444	184	$1,484	311	$32,239	$61,124	$337,224	$11,850

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

GRAFTON COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$5,100	$4,776	$2,700	$150,086	$210,796	$4,538.10	2.15
.....	4,450	55,900	93,500	340,748	565,993	9,225.69	1.63
.....	10,200	19,400	9,400	304,322	425,721	7,808.27	1.73
.....	1,500	800	1,100	104,185	120,456	1,908.03	1.58
.....	10,754	32,990	14,800	575,028	719,392	14,733.40	2.05
.....	450	530	250	87,868	108,914	2,287.25	2.10
.....	16,700	65,650	94,301	469,356	733,088	14,305.01	1.95
.....	4,700	19,010	9,536	241,882	346,052	7,440.12	2.15
.....	13,195	26,613	5,000	399,247	521,372	8,730.25	1.67
.....	.....	5,980	2,000	73,370	101,112	2,780.58	2.75
.....	550	23,413	8,000	63,675	116,340	1,745.10	1.50
.....	.....	.....	.....	22,184	27,588	551.77	2.00
.....	15,440	38,725	27,650	408,950	581,375	9,811.34	1.71
.....	23,994	7,200	3,500	306,599	381,383	4,981.21	1.30
.....	16,444	18,520	5,300	180,984	266,062	3,325.72	1.25
.....	.....	3,860	6,100	76,632	105,178	2,942.60	2.80
$1,790	74,142	37,270	1,500	777,760	1,056,936	18,030.54	1.70
650	87,946	54,100	37,700	834,854	1,190,481	24,524.49	2.71
.....	.....	1,650	.....	69,004	87,268	1,461.89	1.67
.....	2,900	4,976	1,200	197,096	247,530	4,703.07	1.90
.....	14,150	6,496	774	153,446	214,022	3,286.88	1.53
.....	149,718	191,026	100,700	1,678,306	2,455,492	45,592.85	1.85
.....	....	74,000	41,200	103,358	291,538	3,090.32	1.06
....	181,024	44,350	15,650	772,927	1,133,412	22,440.01	1.98
.....	28,188	152,000	.....	1,216,598	1,649,938	43,151.76	2.61
.....	.....	2,500	.....	310,500	321,835	2,711.36	.84
.....	3,568	1,800	4,200	129,250	178,808	3,024.94	1.69
.....	16,318	20,080	5,550	337,795	468,595	8,436.26	1 80
.....	13,676	35,920	34,100	168,204	300,260	4,503.90	1.50
.....	925	670	1,750	48,025	67,360	1,382.20	2.05
.....	7,070	28,100	5,100	290,938	401,699	7,431.43	1.85
.....	15,850	7,076	5,950	246,291	337,624	5,401 98	1.60
.....	.....	58,300	11,050	628,618	821,552	15,780.78	1.91
.....	1,960	18,750	5,600	219,795	300,684	5,412.31	1.80
.....	.....	11,370	.....	136,485	180,057	5,332.31	2.96
.....	15,250	18,900	5,250	191,511	275,162	3,659 52	1.33
.....	.....	9,000	3,500	129,884	147,134	542.92	.37
.....	1,874	9,880	2,000	136,402	192,694	3,478.10	1.80
.....	.....	14,402	2,400	145,316	187,580	4,362.00	2.33
$2,440	$738,036	$1,125,983	$568,311	$12,727,479	$17,838,483	$334,856.26	

TABLE

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

SULLIVAN COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Acworth	166	$16,600	....	.....	....	.....	....	.....	.....	$5,200	.....
Charlestown	362	36,200	....	.....	...	.....	32	$2,420	.....	39,650	$3,600
Claremont	1,491	149,100	2	$45	....	.....	89	8,355	.....	150,310	.....
Cornish	220	22,000	2	300	27	$206	4	400	.....	7,100	.....
Croydon	95	9,500	....	.....	....	.....	1	100	.....	5,180	.....
Goshen	102	10,200	....	.....	....	.....	....	.....	$1,000	3,200	.....
Grantham	101	10,100	....	.....	....	.....	....	.....	.....	.....	.....
Langdon	93	9,300	....	.....	4	20	....	.....	5,500	2,300	.....
Lempster	136	13,600	....	.....	10	40	1	60	.....	.....	.....
Newport	733	73,300	4	300	15	90	24	2,190	1,000	88,624	2,000
Plainfield	291	29,100	....	.....	5	40	4	244	.....	8,668	.....
Springfield	119	11,900	....	.....	3	18	....	.....	.....	700	.....
Sunapee	237	23,700	....	.....	....	.....	....	910	3,500	7,422	.....
Unity	180	18,000	....	.....	4	40	...	.....	.....	5,450	.....
Washington	134	13,400	....	.....	...	.....	6	420	173	.....	.....
Totals	4,660	$466,000	8	$645	68	$454	161	$15,099	$11,173	$323,804	$5,600

COOS COUNTY.

TOWNS.	Polls.		Asses and Mules.		Hogs.		Carriages.		Stock in public funds.	Stock in banks and other corporations in this state.	Stock in corporations out of this state.
	No.	Val.	No.	Val.	No.	Val.	No.	Val.			
Berlin	2,041	$204,100	1	$30	11	$102	35	$1,190	.....	$3,325	.....
Carroll	197	19,700	...	.....	43	294	63	5,280	.....	.....	.....
Clarksville	87	8,700	....	.....	....	.....	....	.....	.....	.....	.....
Colebrook	501	50,100	....	.....	104	405	7	425	.....	67,424	.....
Columbia	173	17,300	....	.....	3	15	....	.....	.....	1,000	.....
Dalton	152	15,200	....	.....	....	.....	....	.....	.....	.....	.....
Dummer	113	11,300	....	.....	2	21	....	.....	.....	.....	.....
Errol	70	7,000	....	.....	8	32	6	356	.....	.....	.....
Gorham	501	50,100	....	.....	8	80	18	1,360	.....	9,500	.....
Jefferson	289	28,900	....	.....	3	14	32	2,600	.....	.....	.....
Lancaster	979	97,900	....	.....	2	13	54	3,740	.....	.....	.....
Milan	367	36,700	...	.....	4	40	....	.....	.....	600	.....
Northumberland	678	67,800	....	.....	5	35	3	225	.....	7,031	.....
Pittsburg	177	17,700	12	250	....	.....	....	.....	.....	.....	.....
Randolph	41	4,100	....	.....	....	.....	....	.....	.....	.....	.....
Shelburne	83	8,300	....	.....	....	.....	10	940	$600	.....	.....
Stark	201	20,100	....	.....	2	14	2	170	.....	250	.....
Stewartstown	288	28,800	....	.....	22	218	2	115	.....	1,800	.....
Stratford	242	24,200	....	.....	....	.....	9	475	.....	19,454	.....
Wentworth's L'n	24	2,400	....	.....	....	.....	2	100	.....	.....	$93
Whitefield	610	61,000	1	20	....	.....	60	3,550	.....	1,700	.....
Total	7,814	$781,400	14	$300	218	$1,283	303	$20,526	$600	$112,034	$93

TABLE.—*Continued.*

Showing Number of Ratable Polls, Valuation, and Amount of Taxes in each Town, as returned by the Assessors for 1897.

SULLIVAN COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.	Rate per cent.
.....	$7,995	$2,800	.....	$216,979	$276,689	$5,093.67	1.84
.....	63,229	30,050	$17,400	648,555	887,550	16,870.46	1.93
.....	127,626	240,696	426,200	2,000,911	3,191,733	67,026.39	2.10
$1,800	22,310	5,308	4,800	379,018	486,346	7,822.8	1.60
.....	6,490	5,050	.....	155,920	202,972	3,653.33	1.80
.....	1,500	3,000	1,000	100,000	136,010	2,584.19	1.90
.....	2,200	4,625	.....	99,275	128,107	2,613.48	2.04
.....	18,212	2,450	1,800	155,396	214,103	2,676.70	1.25
.....	4,799	2,000	4,630	115,431	159,232	3,264.25	2.05
.....	22,840	80,762	.....	1,077,270	1,408,930	33,625.22	2.39
.....	28,506	5,176	1,000	362,510	483,360	7,587.81	1.57
.....	1,195	1,950	700	106,040	139,667	3,772.01	2.70
....	6,744	11,000	....	361,412	442,066	7,691 94	1.74
.....	8,445	850	500	157,660	218,421	3,757.25	1.72
.....	12 600	6,600	5,750	209,716	266,382	3,782.62	1.42
$1,800	$334,691	$402,317	$463,780	$6,146,087	$8,641,508	$171,822.15	

COOS COUNTY.

Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of tax.	Rate per cent.
.....	$2,200	$220,755	$676,850	$1,118,500	$2,249,443	$55,112.37	2.45
.....	1,000	35,000	12,900	253,593	342,208	6,501.93	1.90
.....	3,874	19,928	200	85,910	132,010	2,970.22	2.25
.....	79,735	60,740	.....	521,387	841,154	12,104.26	1.44
.....	1,418	22,980	7,900	185,910	263,422	4,082.04	1.55
.....	.....	9,200	.....	111,964	156,765	3,919.72	2.50
.....	3,840	53,676	.....	99,246	180,122	3,692.50	2.05
.....	915	30,166	.....	102,272	150,526	2,107.22	1.40
.....	4,900	42,680	6,500	372,010	506,230	13,162.04	2.60
.....	950	4,850	550	224,684	296.532	6,750.67	2 27
.....	46,328	96,800	16,325	1,109,020	1,483,480	37,282.53	2.59
.....	7,500	63,312	2,500	203,390	339,116	6,612.76	1.95
.....	9,600	88,050	15,100	432,740	657,257	13,670.95	2.08
.....	7,050	51,286	.....	251,219	352,317	6,517.68	1.85
.....	.....	.....	.....	57,818	65,300	1,306.00	2.00
.....	300	5,820	2,800	104,804	132,816	2,122.63	1.60
.....	4,274	34,802	8,100	173,402	258,253	5,165.04	2.00
.....	21,383	18,230	6,150	264,379	368,110	5,903.00	1.61
.....	10,700	34,942	4,700	265,907	379,356	6,828.40	1.80
.....	1,000	2,400	500	22,125	29,704	743 33	2.50
.....	9,000	113,000	30,500	496,977	703,600	15,908.77	2.26
.....	$215,967	$1,008,617	$791,575	$6,457,257	$9,887,721	$212,464.24	

SUMMARY.

COUNTIES.	POLLS.		ASSES AND MULES.		HOGS.		CARRIAGES.		Stock in public funds.	Stock in banks and other corporations in this state.
	No.	Value.	No.	Val.	No.	Val.	No.	Val.		
Rockingham..	12,478	$1,247,800	5	$120	254	$1,749	923	$87,636	$146,861	$805,842
Strafford.....	9,902	990,200	5	140	29	291	385	32,515	36,644	559,264
Belknap.....	5,330	533,000	....	.....	51	428	160	13,154	3,700	188,918
Carroll	4,382	438,200	6	130	30	213	219	14,690	.....	13,000
Merrimack....	12,946	1,294,600	12	550	189	1,484	703	49,443	57,000	456,369
Hillsborough..	26,767	2,676,700	8	270	243	2,588	409	106,705	64,336	688,600
Cheshire	7,093	709,300	13	411	63	507	341	27,675	19,982	345,501
Sullivan.....	4,660	466,000	8	645	68	454	161	15,099	11,173	323,804
Grafton	11,145	1,114,500	17	444	184	1,484	311	32,239	61,124	337,224
Coös	7,814	781,400	14	300	218	1,283	303	20,526	600	112,034
Total	102,517	$10,251,700	88	$3,010	1,329	$10,481	3,915	$399,682	$401,420	$3,830,556

SUMMARY.

Stock in corporations out of this state.	Surplus capital of banking institutions.	Money on hand, at interest, or on deposit.	Stock in trade.	Mills and their machinery.	Lands and buildings.	Amount of inventory.	Amount of taxes.
$33,500	$3,500	$788,414	$1,366,923	$566,185	$20,443,205	$26,415,526	$469,159.11
300	250	314,057	1,870,446	2,861,084	13,549,600	20,835,759	403,300.85
4,500	.....	195,090	478,762	455,118	6,924,421	9,167,414	180,692.27
5,700	222	107,578	273,734	79,500	4,442,776	6,223,541	121,527.32
60,180	528	590,466	1,440,669	1,527,299	19,584,827	25,956,620	455,820.11
6,055	200	1,054,653	4,597,422	11,109,405	39,220,684	60,659,440	1,197,324.34
6,600	7,120	796,106	992,417	633,640	12,232,750	17,881,722	267,064.31
5,600	1,800	334,691	402,317	463,780	6,146,087	8,641,508	171,822.15
11,850	2,440	738,036	1,125,983	568,311	12,727,479	17,838,483	334,856.26
93	.....	215,967	1,008,617	721,575	6,457,257	9,887,721	212,464.24
$134,378	$16,060	$5,135,058	$13,557,290	$19,055,897	$141,729,086	$203,507,734	$3,814,030.96
* Deposits in savings bank (less amount invested in real estate) with tax thereon.....						50,859,365	385,060.94
Capital in insurance companies, with tax thereon.....						1,375,000	13,750.00
Amount of property taxed and taxes assessed.....						$255,742,099	$4,212,841.90
Average rate per cent, including tax on deposits in savings banks and insurance capital, 1.64.							
Amount of property taxed and taxes assessed in 1896.....						$259,116,800	$4,158,306.59
Average rate per cent in 1895, 1.52; in 1896, 1 60.							

* Not including deposits, and tax thereon, in certain banks in process of liquidation.

ECONOMICS.

ECONOMICS.

OUR WORKINGMEN.

BY F. F. MYRICK.

A retired workingman, who with his wife has lived on an income of one dollar per day for the past ten years, and owes no person a cent, I wish to call the workingman's attention to the following direction our industries are rapidly taking at the present time, and what an opportunity there is for them to better their condition.

The new method of doing business by the formation of a great portion of our industries into large corporations, which we see is being rapidly established in all civilized countries at the present time, and which seems to have come to stay, must be the result of the law of evolution, which always advances whenever the conditions are congenial and favorable for such advancement.

The requirements of hundreds and sometimes thousands of laborers in these establishments to perform the work needed, which the world's rapid increase in population demands, is proof of this fact, and as this condition has come to stay until another advancement is made, our workingmen and capitalists should prepare themselves for it in a way that will be of the greatest benefit to both in the future. All our manufacturing industries seem to be rapidly changing to this principle. There are certain indications which lead to the belief that this principle is being established in the West quite extensively in agriculture.

For as long ago as 1883 a Mr. Moody, who traveled through the western and northern states, tells us that "in the wheat and small grain growing districts of Minnesota and Dakota farms were common which were operated by a superintendent and foreman the same as factories and mills of corporations. And since then, many of those farms have been merged into syndicates." And now we have the Great English Beet Sugar Syndicate which has "secured 150,000 acres in the Sacramento valley, Cal. This syndicate has a capital of $15,000,000, and intends making the venture if money and experience can do it. The land secured embodies tracts from the Glen ranch, the Bidwell ranch, the Phelan estate, and the Sanford estate, with the smaller quantities."

This leaves but little doubt that the future farming of this country will be managed and controlled by syndicates or large corporations on the

most extensive scale. Nature has the same evolutionary laws for the workingman in this direction that she has for the so-called capitalist, for as soon as the workingmen will make the conditions congenial and favorable for an action of progress it will come to them.

A. T. Stewart, Cornelius Vanderbilt, Andrew Carnegie, and many others have shown to the world that a thorough study and practice of the science of economy is the proper means to be adopted for this purpose. Through this study of the science of economy, they have shown how we may lay the foundation of large wealth from small beginnings. If the workingmen could be induced to apply themselves sufficiently to this civilizing study, with the same energetic effort that these men have, they will find that they can greatly improve their condition. But, at the present time, as fast as that which makes wealth is produced by labor, it passes almost immediately into the hands of the few who are wealthy. This is because the most of the great mass of our workingmen do not give their attention to the study of the science of economy, and have not as yet brought their civilizing influence to bear much on the question of human nature. They and the capitalist are so busy with the science of mechanism that they have nearly neglected this moral question, letting it remain almost dormant, far in the rear of our civilization. It is as Buckle says, "That the history of the world shows enormous progress in all kinds of knowledge, in institutions, in commerce, in manufactures, and in every pursuit of human activity, but not in knowledge of moral principles."

Man, being endowed through the law of necessity with the ability of understanding the law of mechanism, has risen far above the lower animals in this respect, and has turned the evolution of mechanism mostly in favor of the human race. He has placed sailing and steamship lines on nearly every ocean on the face of the globe. He has, with the marine telegraph cables, connected nearly all the continents together in one vast whole, and for the convenience of mankind he is enclosing the earth in a web of telegraph and telephone wires, almost annihilating space, that we may converse with each other regardless of distance. Every valley is fast being dotted with their factories filled with machinery for furnishing employment for the surrounding population. Every farm is feeling the beneficial influence of man's invention, while the study of science is made possible by him for the benefit of the whole.

As this question of labor and capital belongs to one of the moral principles, and is so thoroughly merged into one, and so interwoven one with the other, we shall have to look behind them into human nature, that does not seem to advance with the progress of civilization, to find the real trouble. Consequently, there are but few persons among the great

mass of human beings who are fully organized and possess all the qualifications to fulfill this moral law as it should be. Let us furnish the mind with higher thoughts than strikes and lock-outs, and fill their places with hopes and aspirations which may lead us to a thorough study of the science of economy.

The study of economy by our workingmen is just what our condition needs at the present time. If every man would lay by a portion of his weekly wages and put it at interest as fast as saved, he would, at the end of the year, be surprised at the increase of funds in his possession. Keeping a strict account of all expenses tends to lessen the amount spent in many cases. I know this to be a fact from my own experience for the past ten years. The cost of living for myself and wife has been less than one dollar per day. Our food has cost us about eighty-eight cents each per week.

The saving of money from his wages will furnish him with means for purchasing shares in these corporations, if he likes, which will make him worth from fifty to one hundred per cent more to himself and to his employer than those deadheads who bring nothing into the corporation but dollars and cents for their investment. The workingman who has made himself proficient in economy will become a valuable acquisition for his employer and for himself.

In all those industries requiring the combined action of thousands of men, both the company and the workingmen would be greatly benefited by such a move as is here recommended. The habits of economy which the workingmen can bring to themselves will have a tendency to check a great amount of material from going to waste, which is more or less inevitable under the present system.

Let us take the railroads as an example. What a saving it would be to them if the engineers, conductors, and other employees of the roads should own shares in them, the same as the capitalists do. There would be a great deal more care taken in the running of the trains, and, in fact, much more care in every department. We can readily see that all these workingmen would realize a responsibility, and make an effort to save expense in the running of the trains in every way. They would give the strictest attention to every department, so that the careless wrecking of a train, wasting thousands of dollars at one blow and sacrificing people's lives, would be almost entirely avoided.

Highly paid labor is proving to be the cheapest, so says our consul-general of Germany, Frank H. Mason. He says that "it has been demonstrated that under intelligent, progressive management, highly paid labor, especially when employed to use complicated machinery, is, after all, the cheapest, and that in the race for supremacy the inert, congested

populations of the Old World have been in many cases left behind by the people of the United States who, more than any other, have reduced economy of labor to an exact science."

Let the study of this nation be the science of economy, and teach it in all our public schools. We shall then begin to bring labor and capital together in harmony as they have never been before.

ESSAY ON PURCHASING POWER OF WAGES.

BY CHARLES M. DU PUY.

Are financial delusions a bar to progress?

How may the people be sufficiently employed in competition with new inventions and discoveries which daily make the struggle more difficult?

Every year productions are more cheaply created by new devices. Not a day passes without witnessing some new discovery to compete with and cheapen labor. Power machinery has usurped the place of hand labor. Tools, both large and small, are more thoroughly perfected each year, and the discoveries of science constantly open shorter and newer roads to vie successfully with the old methods. In every direction things are produced at less and less cost.

Why There Is an Inability to Purchase. This would all be well if our present system did not at the same time more than proportionally lessen the profits of human labor by which commodities are purchased. Unfortunately the labor of hand and brain is either daily wasted beyond recovery, or is so imperfectly compensated as to be denied a sufficient power to purchase. The average purchasing power of the people is so much restricted as not to permit them to have a reasonable use of these cheapened productions. Hence in the midst of an apparent abundance, poverty unduly prevails, and the difficulty daily grows more serious. Applicants at the employer's threshold meet hundreds upon the same errand who go their way hopelessly disappointed. All avenues are over-crowded, because machinery devices and discoveries supersede human labor. The growth of cotton surpasses its profitable sale. The output of looms and spindles exceeds the market demand for cloth. This is not because there is a surplus of cloth, but because there is an inability of a majority of the people to buy sufficient cloth for use, out of the profits of their labor. In like manner the demand for all other productions is correspondingly limited. So everywhere a use of commodities is denied, owing to the limited purchasing power.

Why is it that millions of the race are denied that which should be the inherent right of all—that is, to market the fruit of their energy? After summing up thriftlessness, imprudence, and worthlessness at the most liberal estimate, and charging whatever is due to nature's sterile soils and frost-locked seasons, a vast margin of poverty is still unsatisfactorily explained.

Under Every Possible Condition Labor Must Be Employed. Undoubtedly automatic machinery and modern discovery are answerable for much of the displacement of labor, and the difficulty of securing for it comfortable existence; but must there not be a sad lack of general intelligence and of a comprehensive adaptation to circumstances, that fails to meet and overcome these grave economic difficulties? Society ignorantly aids in making vagabonds, and then pays dearly to convict and imprison them. It prompts suicide by furnishing no outlet for the despair of hopeless poverty. Is there no possible way to change this sad condition? The self satisfied few see no remedy. A majority of those who enjoy the fruit of toil without personal effort are blind to the situation. Notwithstanding this, the time must come when a solution will be imperatively demanded; for, whatever may be the perfection of machinery and discovery to cheapen productions, human labor must nevertheless be sufficiently employed to purchase these productions. It is not only the normal right of labor, but the very necessity of human existence. Under every possible circumstance labor must be utilized for the well-being of society. If man's energy, aided by discoveries, succeeds in multiplying commodities, either fifty or a hundred fold, or however much the increase may be, a way must be found to provide for its use. How can such a way be opened?

Natural Opportunities Exist Everywhere. The whole country, the whole world, lies open for development. It is in a state of comparatively barren unfruitfulness when contrasted with what might be its yield. Greater activity, with all the possible aid of modern devices, is demanded to smooth its ruggedness and adapt it more generally to human comfort. The progress of this century is but a faint prelude of what should be the grander development of the twentieth century, accelerated as it should be by the accumulating discoveries of the past.

Cast your eyes around and observe everywhere amid wasted energy, how impediments, which might readily be removed, are allowed to exist and obstruct a healthful social growth. See how prevailing malaria abounds from imperfect drainage, begetting fevers and death. See poor roadways everywhere needlessly taxing human energy and obstructing traffic. Observe the poor food, shelter, and clothing which falls to the lot of so large a proportion of the people. In every field of human effort

see how much more labor is required to improve and utilize natural advantages, while labor is daily permitted to go to total and irrecoverable waste. The great fault of society must be in its continuance in the old, old way, when the laws of progress clearly beckon it onward to better methods.

Vast Fields Opened for Development by Modern Discoveries. Let us survey some of these fields. How much easier and cheaper might the interchanges of domestic commerce be made. For example: The colossal commerce of Canada and the sixteen states tributary to the great northern lakes, although but in its infancy, already annually exceeds thirty millions of tons, or more than three times the world's present tonnage through the Suez canal. Its future growth, which will almost exceed any reasonable estimate, demands the cheapest means of transportation. For this purpose a great ship highway has been proposed to pass unbroken cargoes from these inland waters to the ocean. The Sault Ste. Marie lock, in Michigan, recently completed by the federal government, to connect Lake Superior with the lower lakes is 560 feet long, 60 feet wide, and of 26 feet depth. The Drainage canal at Chicago, connecting Lake Michigan with the waters of the Mississippi, will soon likewise be finished. This canal has a depth of 26 feet and a surface of 300 feet. Its lockage, like the Sault Ste. Marie, is adequate to pass any ship that can sail the lakes. The capacity of these two great improvements will pass ships of 8,000 tons burden which now navigate the lakes, and is a fair gauge of what should be the entire waterway from the head-waters of the Mississippi to the Atlantic Ocean.

New Methods Have Wonderfully Lessened Cost. Modern devices have greatly cheapened construction, and invited improvements throughout the country on a more extensive scale than have ever hitherto been undertaken. The Chicago canal will cost less than half the original estimate. Hundreds of drills, worked by one central power, cheaply and rapidly cut the rock; modern dynamite explosives, in place of gunpowder, save millions of dollars in blasting; and enormous modern hoisting, shoveling, and conveying devices, by the simple turning of a crank, hoist and remove the material at a fraction of what would be the cost of human labor. These modern appliances demonstrate how machinery now triumphs over what have been hitherto considered impossible obstacles; they have paved the way in all directions for a newer, bolder, and cheaper system of public improvements.

No insuperable difficulty now exists to prevent a ship waterway not only from the Mississippi valley through the Great Lakes to the St. Lawrence, and thence across to and down the Valley of the Hudson to the ocean, but also from Hudson Bay and the Red River of the North

through the Great Lakes and by the same route to the sea. Modern pneumatic locks will now lift vessels at one operation 150 feet with as much facility as the old locks lifted them ten feet.

Great ship canals are no longer a chimera, but are made eminently practical by the various modern discoveries and inventions, which have so vastly cheapened construction. A canal at the isthmus, connecting the Atlantic and Pacific Oceans, may now be easily accomplished for a great saving to the world's commerce. In any section of the country, wherever life will be made easier by useful public improvements, there the energy of man, aided by modern appliances, is now invited to remove obstructions which hitherto have been considered impassable.

The great natural waterways of the Mississippi and its tributaries, as well as of other streams, are by modern discoveries made susceptible of easy improvement. Not only may the channels of these streams be now cheaply deepened and their banks be better guarded from overflow and abrasion, but a system of storage of much of the surplus water, for use in dry seasons, may be practically accomplished. By these few foregoing illustrations it may be realized that in all of the various departments of human skill, the field for more labor lies wide open for occupation, without regard to present or prospective improvements or discoveries.

Ignorance Should No Longer Hamper Energy. No imaginary fetters conceived in ignorance should be allowed longer to cramp the career of man. It is the natural law of progress that he should henceforth bound forward with a speed greatly accelerated by modern discoveries in the arts and sciences. They who would impede his movement and waste his energy by selfish appeals should be pushed aside, for the general advance of the race transcends, beyond measure, all consideration of individual interest.

With energy pressing to avail of natural opportunities in every direction, can society rightfully continue longer to hedge itself around with artificial and unnecessary barriers to progress?

Does Money Actually Contribute Profit? Is the specious credit of banks and money changers essential to the cause of advancement in this age of modern discovery? What is the relation between progress and money? Whether the money is gold, silver, or paper, so far as human progress is concerned, is it not a mere *counter, a token?* Have services, commodities, and ideas, when well welded together, ever gathered increased productiveness from money? Does money really contribute inherent profit of itself? Is it not rather an undue absorber of the profits of production? Does not the union of the three forces, commodities, services, and ideas, furnish all the sources of increase, independent

of money? Away, then, with the quibbling argument that money is essential to promote development. We shall see hereafter that services, commodities, and ideas have been welded together with profitable return without regard to a money medium.

How the Guernsey Market-house Was Built without Money. In Duncan's work on "Bank Charters," it is stated that the town of St. Peters, island of Guernsey, desired to build a covered market-house. They had an abundance of idle labor and ample material for the purpose, but no money. In their extremity, they appealed for relief to the governor. With wise forethought he caused the issue of paper warrants of small denomination, which were duly signed, stamped, and declared legal tender, of sufficient amount to buy the material and pay for the required labor. These warrants were gradually redeemed in rent for stalls in the market-house, and when all were so paid, were cancelled and destroyed. Thus the work was begun and completed, trade was made active by the circulation of warrants, and the market-house in the end became public property without the load of a bonded debt as a mortgage on posterity.

The Lesson It Teaches. The above simple lesson shows how well conceived public works, *certain to yield a reasonable income over cost*, may be constructed without gold, silver, or bank credit. Such solid enterprises become *themselves the guarantors* for investment and public confidence, independent of private credit.

Why may not any proposed city, state, or national enterprise of moment, whose productiveness is assured, be constructed and paid for like the Guernsey market-house, by warrants of small denomination, specifically issued on the enterprise; these warrants to be received at ten per cent premium in place of money, and to be afterward cancelled, leaving the improvement ever after public property without bonded debt? Why would not these small warrants be like the French *rentes*, a favorite investment for the people generally?

The Field Opened to the Harvest. A vaster field for opportunity is now opened for the people to occupy through the various modern discoveries and inventions, and their collateral advantages, than has ever before been presented. With the opportunity has come a practical method of more widely interchanging services, commodities, and ideas, on a grand scale—a method independent of the arbitrary restrictions of gold or silver. This impetus has not come through expensive wars and destructiveness to life, but it has come silently to herald beneficent and peaceful pursuits in order generally to ameliorate the condition of the human race. The twentieth century will soon be called upon to decide upon this great problem with a comprehensive and far-seeing economy. Let us hope it will be equal to the emergency that will be thrust upon it.

THE MACHINE AND THE WORKER.

The "Philadelphia Record" takes issue with those who maintain that the lack of the demand for labor is due to the use of labor-saving machinery. It admits, of course, that when a machine enables one man to do the work of three or four there must be overproduction and lack of employment if there is no greater demand for the products than there was before the machine was invented; but it contends that the lessening of cost by machinery enables people to buy so much more freely that the increased use offsets the increased production, and therefore that machinery puts within reach of the worker much that was formerly beyond his means, without diminishing the demand for his labor. In the course of a long article it says:

"If it had been true that the introduction of machines in place of hand labor produced the effect so often proclaimed we should have perceived a large falling off in the number of persons employed in occupations in which machines have been introduced; but we find precisely an opposite result. The number of farmers (male) increased from 2,958,630 in 1870 to 5,055,130 in 1890. The number of female farmers also increased from 22,681 in 1870 to 226,427 in 1890. The number of persons (males) engaged in manufacturing and mechanical industries increased from 2,098,246 in 1870 to 4,064,051 in 1890; of females, from 353,997 to 1,027,242 in 1890. Examining one hundred and twenty specified occupations, we find in all cases an increase in the number of persons employed in 1890 over those so employed in 1880 and 1870. The largest ratios of increase in number of operatives are, moreover, to be observed in those trades and occupations in which labor-saving machinery has been most largely introduced. The reason for this is the enormously increased demand and production. Let us suppose that a machine may be invented which will perform as much as five hands; this at first displaces four hand workers, but very soon the increased demand for the cheaper goods compels the manufacturer to buy more machines, until, in the end, more hands are employed in tending these machines than were originally engaged in making the goods. Take, for example, dressmakers, milliners, and seamstresses (females); these have increased from 90,861 in 1870 to 494,458 in 1890. Boot and shoe makers and repairers (males) have increased from 161,485 in 1870 to 179,867 in 1890, and female boot and shoe operatives have increased from 9,642 in 1870 to 33,677 in 1890. There is, perhaps, no industry in which machines have superseded hand work more generally than in this particular trade. The great increase in the number of females

employed is an evidence of this fact; yet the total number of male boot and shoe makers and repairers is progressively larger in each census return."

Whether these increases in the number of persons engaged in gainful occupation was out of proportion to the growth of our population we will not stop to inquire. Admitting that they were, the figures are very misleading, because the census draws no distinction between those who are at work in their callings and those who have no work to do. If a man is a shoemaker by trade he is classed as a shoemaker, though he may have had no employment for a year. If he lives on a farm he is enumerated as a farmer, though he has not farm work enough to keep him busy a fourth of the time. In brief, the census shows how many people are engaged in the various occupations when they are furnished with employment, and not how many find a market for their industry and skill, and it may be that the "Record's" statistics prove the very reverse of what it claims. One of its illustrations is this:

"Statistics prove that there are more people employed to-day in manufacturing watch-making machinery alone than were employed in the entire trade of making watches in the days of hand work. Formerly timepieces were luxuries, owned only by the rich; the masses depended on the town clock or the curfew for knowledge of the hour. Now every mechanic and schoolboy owns a watch. One factory alone in New England has sold millions of cheap watches, which are good time-keepers. A good new watch may now be bought for less money than is commonly paid for cleaning an expensive watch."

This is all true, but it will not do to take a single trade and assume that the facts in regard to it are of general application. The use of machinery and the consequent cheapening of watches has brought them into general use and expanded to enormous proportions the demand for them, as it has a thousand other articles that were once regarded as luxuries; but when it comes to the prime necessaries of life, in the production and transportation and exchange of which most people are engaged, this is true only to a very limited extent. The average family consumes more bread and meat when they are cheap than when they are dear, but not much; that is, such a family must have about so much food of some kind, and the nation as a whole does not eat much more than it would if reapers and planters had never been invented. So of clothing. A yard of cotton cloth wears as long and is in every way just as useful when it represents a labor cost of but four cents, as a yard of the same quality would if the item of labor in it was eight cents. A shoe made on a machine for thirty cents is as serviceable as one just like it would be made upon a different machine for sixty cents.

Less economy, fewer patches, and less consumption of crusts and hash may be necessary when wheat and beef and cloth and shoes are cheap, but the margin does not begin to equal the increased production, due to machinery, of those engaged in growing the standard foods and furnishing comfortable clothing. If there had been no improvement in cotton machinery since 1870 all the operators in the country could not supply the wants of the people in their line. Machines have made it possible for women to do much of the work that men formerly performed, but this is by no means to the advantage of workingmen who are not disposed to let their wives support them. We quite agree with our contemporary that machinery has improved the lot of the workingman in America, not only by decreasing manual labor, but by increasing wages and decreasing the cost of all the products of machinery which the wage-earners consume, but that it is responsible for the over-supply of labor seems very clear, and that the only remedy is in less hours is equally plain.

MACHINERY AND SHORT DAYS.

The Boston & Maine Railroad has just completed at Concord a number of shops in which it is expected half the necessary repairs upon the locomotives and cars of this immense system will be made. These shops are new, arranged upon the most approved plans, and equipped with the best of modern machinery and labor-saving devices. As a result about three hundred men will do the work upon which about five hundred have been employed in the old shops, at different points, that have now been abandoned.

In Boston the mails are shot through an underground tube by the force of compressed air between the post-office and the great railway stations, each of the cylinders in which they are conveyed making the trip in a minute and a half. The result is that a hundred mail wagons will soon be discarded, and instead of that number of men engaged in that work there will be eight or ten operating the machinery connected with the new system. A cotton mill that employed 6,000 people in 1892 can run as much machinery and turn out as many goods this year with 4,500. The result is that 1,500 are out of work. A steam shovel cuts its way through a hill, with half a dozen men to operate it, faster than a hundred men could have dug the same channel with shovels.

These are simply illustrations of the revolution that is going on in every industry and every field of productive enterprise with such rapidity that the most vigilant can scarcely keep track of it in their own call-

ings. It has seemed for a long time as if inventive genius must soon exhaust itself, and the multiplication of labor-saving devices come to an end; but instead of that every new machine and process seem to pave the way for others, and every year the farm and factory and shop and mine are operated with less labor, while their production is increased, with a resulting lack of demand for labor at any price.

There is great compensation of course in the cheapening of the products of industry and skill which if made by hand in the old way could not be sold at any such prices as they are now. The yard of cotton cloth that it cost ten cents to make forty years ago can be put upon the market at a profit for six cents to-day, and so of nearly everything else which the great mass of people have to buy, except certain foods into whose production machinery cannot enter to any great extent. But notwithstanding this, which either lessens the cost of living or, as is oftener the case, brings within the reach of people what was a few years ago far beyond their grasp, we are fast coming to believe that labor-saving machinery is the most serious and most troublesome feature of the labor problem, which is at present the most important one that confronts all civilized countries, and we can see no possible solution of it except in a great lessening in the hours of labor. People produced all that the market demanded before machinery came into play. If with a machine a man accomplishes three or four times as much as one could by hand it is inevitable that there should be over-production, or that a large share of those who want to work and need to work should lack employment, even though the demand be increased fifty per cent by the cheapening of cost.

There has been great reduction in the length of the working day, which is now only ten hours as against fourteen or sixteen hours half a century ago; but even this is only a beginning of what is necessary in order to balance the enormous increase of production. If there could be a universal world-wide law absolutely prohibiting ordinary wage workers from toiling more than six or seven hours in any day it would be better for all concerned. The difficulty, and it is an almost insuperable one, comes in making such a law universal. No manufacturer, contractor, farmer, or mine operator can reduce his working day to six or eight hours while his competitor runs his machinery ten or eleven hours. No state can make eight hours a day's work without destroying its industries while neighboring states provide for ten hours' work in a day. No country can by working short hours compete with others that work long hours unless it has great natural advantages or can protect itself by tariffs or other legislation. Hence the reduction has to come very gradually, here a little and there a little, so as not to put one section

or trade at a fatal disadvantage as compared with others. A difference of an hour in a week may be borne when one of an hour in each day would be ruinous. Hence, too, the conflicts and contests which are elements in the reduction process. But eventually we shall come to it; slowly, painfully we shall get down or up to a very short working day in every field of industry in which machinery plays an important part. The road is a very rough one but it must be traveled.

DEMONSTRATION OF UNION LABOR.

There are signs of waning strength in the Boot and Shoe Workers' Union in Lynn. Cutters' Union 99, with a membership of over 200, has surrendered its charter, and is to form a social club. The union is preparing a statement, soon to be made public, giving reasons for its withdrawal. In brief, these will be that the members of the union have received no benefit from the membership in the Boot and Shoe Workers, and have been frequently assessed to support strikes that have had no connection with them.

But there are other reasons. The Cutters' Union of the Knights of Labor have waged vigorous war against the Boot and Shoe Workers, and in the Boot and Shoe Workers' Union strike at the Williams, Clark & Co. factory, after the cutters of the organization had withdrawn, declared the shop open for Knights of Labor men. This defeated the strike of the Boot and Shoe Workers, and Williams, Clark & Co. now run a free shop.

In other strikes similar action has been taken, and labor unions in the city have lost strength and importance. The result of the action of the convention of the Boot and Shoe Workers in Boston in voting to take present action, has been displeasing to the Lynn members, for they claim that the socialists captured the organization. In the other unions of the shoe trade in the city there is a lack of interest. Members withdraw, and the meetings are attended but sparsely. Two other unions are expected to surrender charters. This condition of affairs leaves unionism in Lynn in a demoralized state.

A PAIR OF SHOES.

One of the big Lynn shoe-shops made a pair of ladies' boots for the Paris Exposition of 1889 in twenty-four minutes. A notary public followed the operation, watch in hand. For this feat the pair of shoes went through the usual routine of the shop, but at exceptional speed. Fifty-

seven different operators and 42 machines were concerned in the work, which required 26 pieces of leather, 14 pieces of cloth, 24 buttons, 24 buttonholes, 80 tacks, 20 nails, 2 box toes, 2 steel shanks, and 20 yards of thread. Since that time the division of labor upon a pair of shoes has become still greater, and there is a larger number of machines employed, with the result that a pair of ladies' boots can now be made complete in this factory inside of twenty minutes.—*Philip G. Hubert, Jr., in "Scribner's."*

HOW SOME SAVE MONEY.

A shoemaker was complaining about business, not but that he had work enough to do in the cobbler's shop, but that so many get trusted and forget to pay, or stand him off. "Why," said he, "what do you think of this? One man has been owing me a little job four months, and what do you think is his excuse? He was married not a great while ago, and he says he can't pay yet because he and his wife, who works in a shoe-shop, have agreed to put in the savings bank thirty-five dollars every month, and when they do that he can't spare the money for my little bill, but perhaps some month he can. I can't see it in the way he does. It looks to me as if he had deposited some of my money in his name."

LABOR'S SHARE OF PROSPERITY.

It is larger in the United States than in any other country on earth. There appears in Extra Census Bulletin No. 67 of the eleventh census an array of statistics concerning the relation of labor to capital which is likely to excite widespread interest among students of economic problems. The figures deal with manufacturing industries in this country, the purpose being to show what proportion of such enterprises goes to the labor employed in them. A clear understanding of the matter is presented in the following table, which covers manufactures in the United States during the year 1890:

Product, total	$9,370,107,624
Material and miscellaneous cost	$5,789,812,411
Wages, cost	2,282,823,265
Balance to capital	$1,297,471,948

These statistics lead to two or three highly important conclusions. They show, in the first place, that the real capitalists of the country are the workingmen, whose aggregate daily income of more than $20,000,000 completely overshadows the money combinations formed

by their employers. It also appears that labor's share in the profits of manufacturing industries is vastly larger than the share that goes to capital.

Moreover, as a brief comparison will prove, the American workman is the best paid laborer in the world, whose average return from the profit of productive industry is steadily increasing. The relative status of American labor is strikingly illustrated in an article in the London "Times." It was there set forth that in distributing the profits of manufacturing enterprises in England, 21 per cent goes to capital, 23 per cent to government, and 56 per cent to labor. In France 43 per cent goes to capital, 23 per cent to government, and 41 per cent to labor. In the United States, however, 23 per cent goes to capital, 5 per cent to government, and 72 per cent to labor. It thus appears that, while the profits of capital are about the same in all three countries, labor receives 16 per cent more in America than it does in England, and 31 per cent more than it does in France.

These figures demonstrate that labor in the United States enjoys advantages that do not exist in any other country, and they account for the conditions which have made the American wage-earner the most intelligent as well as the most contented and patriotic man of his class to be found in the whole world.

LABOR BUREAUS.

LABOR BUREAUS.

CARROLL DAVIDSON WRIGHT.

Carroll D. Wright, Commissioner of Labor, United States Department of Labor, Washington, D. C., who has just been honored with membership in the Institute of France, and honorary membership in the Imperial Russian Academy of Sciences, is one of the foremost statisticians of the world. "Few statisticians," says the Chicago "Times-Herald," "have been so careful as he to present bare facts, and to present them as fully as the statistician can." It was he who originated the now famous and much misquoted saying, "Figures do not lie, but liars figure."

This noted labor statistician, born in Dunbarton, Merrimack county, N. H., July 25, 1840, began life as a country schoolmaster in his native state, and went from pedagogy to law. Dropping his commentaries for his musket, he went to war as a private in the 14th Regt. of N. H. Vols., in 1862, and was promoted colonel of his regiment, December 28, 1864, and after fighting to the end of the strife, he resumed his law work, was admitted to the bar, and began practice of his profession in Boston; was elected to the Massachusetts senate in 1871, and served during the sessions of 1871, 1872, and 1873, when he was placed in charge of the State Labor Bureau of Massachusetts, to take which position he gave up a law practice of $10,000 a year. In 1885 he was made the first commissioner of the United States Department of Labor.

His published works make a very considerable library of labor statistics.

THE NATIONAL ASSOCIATION OF OFFICIALS OF BUREAUS OF LABOR OF THE UNITED STATES.

EXTRACT FROM REPORT OF PROCEEDINGS.

The thirteenth annual convention of the National Association of Officials of Bureaus of Labor Statistics met in the senate chamber of the state capitol at Nashville, Tenn., May 19, 1897, at 10.15 o'clock A. M., President Carroll D. Wright in the chair. In calling the convention to order, the president spoke as follows:

"*Fellow Chiefs and Commissioners.*—For the second time in the history of our association we meet in a Southern city. At the second convention, which occurred in 1884, when there were only six or seven Bureaus of Statistics of Labor in the United States, we met in St. Louis.

Since then all of our meetings have been either in the North or West; but we congratulate ourselves now upon meeting in this Southern city, and it may be that our deliberations here will be of some service, not only to the city of Nashville, but to the state of Tennessee, and with this thought in view I trust you will excuse me if I speak somewhat at length this morning in opening our convention.

"The question is often asked, and we have answered it every year: What is the purpose of this chain of offices, reaching from Maine to California, and now numbering thirty-three in all, with a Federal Department of Labor whose general purposes and motives are the same as those which actuate the state offices? The impression generally prevails among those who have not come in close contact with the results of the work of these bureaus, that they are in some way connected with various propaganda or with labor agitation, that their purpose is to secure certain things in the way of legislative concessions to labor or to help make attacks upon capital. Nothing is further from the truth than this impression. Our bureaus belong to the educational functions of the estate. We have nothing to do with solutions, except in so far as facts properly and honestly collected and accurately and scientifically analyzed and published may help in the solution of some of the difficult problems which confront us everywhere in these closing years of the nineteenth century. The labor question occupies a different position each succeeding decade or generation. What it may have been once does not indicate what it is now. Formerly the labor question was a very narrow one, and consisted simply in the proposition, How can wages be raised or the working hours per day reduced? And the demand of the wage worker in former times was for an increase of wages or a decrease in the hours of labor, or both, with a view to elevating his standard of life. You should remember that when this demand was first made wages were paid in accordance with David Ricardo's old and well-known 'iron law of wages,' under which the rate of wages was fixed at a point which simply covered the absolute physical necessities of a man, his clothing, his food, and his shelter. This much was to be granted for day labor, simply that the physical machine, the working anatomy, should not depreciate in value; but in the last generation or two there has come something beyond this which means more than the mere physical wants of man, and this something else relates to the workingman's interest in society, how he can receive wages enough to enable him to become what he has been made everywhere, a political, a social, and a moral factor in the community. He now receives in wages from ten to fifteen per cent margin above the rate which the 'iron law of wages' would fix as his compensation for so much labor rendered. This

extra demand for some of the elevating and spiritualizing influences of life lies at the bottom of the labor question to-day; and so it means sociology as a whole, the science of society—how can society grow, and grow in the very best way, so that all men shall receive something of the things in this life which mean culture, education—art, even.

"This demand wherever you meet it is evidenced by what we call 'social unrest,' and it is the function of these offices which we represent to contribute facts, and facts only, which shall help us to understand the meaning of this social unrest, and enable us to determine, if possible, whether there shall be any danger in it, or whether the social unrest means something that shall carry civilization still farther up in the advance of the times. Then what is the labor question concretely stated? The underlying factors of the labor question had their origin so long ago, that history gives no account of them, as far back as when a certain tribe lived on the table-lands of Central Asia, away back of the historic period, and so far back that all we know of it comes from the Sanscrit. This tribe grew refined; it became intelligent; it built boats, and steered them in the streams with a rudder, and propelled them with oars as we do to-day; it wove cloth; it did many things that indicate a higher sense of true civilization; and then, gentlemen, commenced that great fever of unrest, which has followed the Aryan race to this moment, and will follow it until the end, whenever that may be, thousands or millions of years hence, and it is to this unrest that our Western Hemisphere owes its existence as a populated land. As soon as this tribe, that grew somewhat refined, found itself in that position, the ambition seized its members and a portion of the old tribe came down from the table-lands of Central Asia and found itself wandering westward. Other sections came down behind them, and pushed on those that were in advance, and they crossed the eastern waters and settled the Hellenic states. They made Central Europe what it is, and, finally, crossed the English Channel and settled Great Britain, and soon found themselves fretting on the outmost western rock of the Irish coast, with just as much unrest in their souls as they ever had during the centuries back of them, and they peered into the western ocean, and finally one of their number, one day in October, in 1492, found himself still peering from the deck of his battered little caravel into the west, and this great continent was discovered. More of his tribe kept sweeping on and sweeping on, settling a fringe all along the Atlantic coast, crossing the rivers, and finding themselves at last beyond the Mississippi, until now the sons of this old, ambitious Aryan race are fretting on the outmost western coast of this country. Whether or not they will in time sweep over the Pacific and reach again the table lands of Central Asia is a great question in sociol-

ogy, but my reason for referring to this fact is to show you that the unrest which made this country what it is, is of the remotest origin, and we Americans find in our veins to-day the very life blood which made those characters thousands of years ago distinctive, and this unrest has followed us, and is following us, and we are feeling it in accessions as the generations pile up in the passage of time.

"This, gentlemen, concretely, is the labor question of to-day: What shall be done with this unrest; how shall it be shaped; not whether it can be killed, but whether the struggle under it can be softened, can be guided, can be moulded into some force which shall mean the very best for human conditions. So, when we speak of the labor question in the narrow sense it is because we do not comprehend it; but what our bureaus mean when they use the term 'labor question' is the physical, the moral, and the social condition of the great bulk of the people that make the world go after all. Therefore, when we contribute facts, when we investigate conditions, we are simply contributing something to help legislators, to help philosophers, economists, writers, and students everywhere to know better how to soften these conditions, and how to help the common man to a higher and more elevated standard of living. Not to solve problems, because no one of them can be solved; there is no complete solution of the labor question in all its phases, and when a body of men find a solution for all of the existing problems of to-day I want to assure you that immediately after you will witness the death of industry and a stagnation of the community at large. There is a great deal of pathetic talk about unrest, about discontent, and there are several kinds of discontent which prevail; but the discontent that is legitimate is that which impels men, always and ever, to seek better conditions. That is what has brought millions across the stormy western ocean to settle in this land; that is what has made the United States what it is; that is what is building the South into a great industrial empire. Now, as facts are collected, classified, and systematized, we find that out of them all, which means the knowledge of conditions as they are, there is growing a new political economy, which Henry D. Lloyd has defined. I will use his words:

" 'There is a new political economy, which looks first "to the care and culture of men." There is a new struggle for life, the life of others. There is a new science which finds man in the same womb with the fish, the dog, the serpent, the bird, and traces his lineage back to brotherhood with the humblest life of the planet. There is a new self-interest of the individual who puts his family before himself, his country before his family, mankind before his country, because there is filtering into his consciousness the vast fact that his share of what is done for him by

mankind is of far more value to him than what he does for himself. There is a new self-interest of the community which is going into the slums, factories, mines, sewers, to make all safe by making its weakest safe. There is a new state, the organized body of Christ, which feeds the hungry, heals the sick, and visits those in prison, and gathers up the children. There is a new religion,—a religion of progress, and of man as a partner in the creation of that progress, creating new ideas, new species of plants and animals, new men and new society. Mankind prays to the "All-Perfect Father," but as it utters the words the indomitable within whispers that if God should stop at perfection man would pass Him by.'

"There is a new political economy, then, and the facts which we are helping to collect are assisting in its creation. This new political economy seeks the co-ordination of ethical forces with economical forces. Now you see how difficult it is, if I am right in this position, to solve any problem. Our bureaus contribute the facts which show all there is in arbitration, and yet we all recognize that industrial arbitration is not a solution of the great labor problem itself, as has been contended. We contribute facts to show the relation of the alcoholic liquor traffic to crime, insanity, and pauperism, but we know well that the economic complications of this traffic cannot be removed at the present time. We know that however desirable it may be that temperance principles should prevail, there are great economic difficulties in the way, one of which is that should you wipe alcohol from the face of the earth, you would turn 90,000,000 bushels of corn back on the farmer, throw millions out of employment, and destroy the activity of a billion dollars of capital. Can such a state of affairs be brought about instantaneously by legislation or any other process and not disturb the whole industrial equilibrium of the country? Our bureaus show the facts relating to employers' liability; they do not argue, but they show conditions, and thus our legislators are able to discuss with intelligence such a problem as that of employers' liability when it comes up.

"There are many other features to which we contribute, but we know they are not solutions. A legislature cannot solve economic problems, any more than can the voluntary remedies which are projected, such as an increase of wages, establishment of a system of profit sharing, co-operation, socialism, nationalism, or the ever present single tax. We all know that these are phases and not complete solutions. We know, says John Stuart Mill, that there is no one thing which can be done, which, when done, will relieve the world of all the incongruities, misery, and unhappiness that exist. We know that these things need study and co-ordination, and it is only through the collection of facts, from bottom conditions, that these things can be of any service; the co-ordination

of vital principles of competition and social service, the old economic man of Ricardo, the social man of to-day—a man who must believe and know that to meet success he must render the very best service that is in him to his community, and that it is the community's duty to render the very best service to the individual.

"These bureaus are not socialistic, either. They do not preach the doctrine of socialism, even, as is sometimes the case, when the heads of the office may be socialistic in their tendencies. They know the difference between revolutionary socialism and constructive socialism. They know the iniquity and immorality, even, of granting equal compensation for unequal service. They recognize, on the other hand, however, all the vitality that there is in socialism, and that vitality consists in its being a criticism, not a philosophy nor a system. We know well that only in the character of men is to be found the solution of any problem. We know that in the elevation and the broadening of the individual is to be found the very best social system and the very best social standards. Now, with these aims before it, this body of men meets annually for the purpose of discussing methods of how to reach these facts, which are so important in the consideration of the vexed questions of the day so far as they relate in any way to industry. If industry does not flourish and is not healthy, the community itself must suffer, for all society wherever it exists is dependent upon a vigorous condition of industry. We need not, therefore, advance any particular theory or advocate any particular solution, but simply content ourselves with going forward on the lines which have been laid out by our respective legislatures, which point out our simple duty of collecting facts and fearlessly publishing them, whether they affect our own individual theories or the theories of the party which may be in power at the time. It is only in this way that we can help the nation and help the state, and constitute as time goes on the true remedy which lies in the practical application of some of the simplest rules of that great body of principles known as Christianity. This may sound very much like a platitude, but if there be any other way, no philosopher or economist has yet discovered it.

"So, to provide solutions, and to give mankind a better standard of living, the attack must be made all along the line and not at any one point. Dr. William T. Harris, the Commissioner of Education, has defined a crank. He says a crank is a man who sees something very clearly, but not in its relations; and it is so in the attempts to solve phases of the labor problem. One man sees a thing very clearly; he sees that the temperance question involves the happiness and economic conditions of men, and he thinks that if temperance principles could only prevail the world would be happy. Another man ignores that and says, 'If you can only establish industrial arbitration you will settle all your dif-

ficulties.' Another man thinks that the eight-hour day would solve the problem and remove all difficulties attending industrial conditions. All these things are good, but they must be considered together in their relations one to the other, or else you are simply setting up bricks to be knocked down. Our duty, then, whether as commissioners of labor, or in whatever capacity we may serve, is to help contribute to the sum of knowledge which shall ultimately soften this struggle without attempting to remove that divine discontent which makes the world what it is, and which gives us whatever civilization now exists. With these views our bureaus exist, and as the knowledge of their purposes and motives is better comprehended in states and in communities, we advance along true lines, and it is a great pleasure to me to say to you, gentlemen of Tennessee who are present this morning, that you have representatives in the United States senate and in the house of representatives who have always stood behind and helped along this kind of work, knowing very well that there is no partisanship in it, no politics in it, no propagandism in it, but simply an effort to contribute something to the sum of general knowledge."

BUREAUS OF STATISTICS AND LABOR.

To those who do not understand what gigantic proportions this class of work is assuming, the following directory, compiled from official records, will be of great interest and aid in the general uplifting of our laboring class.

The date of organization and location of all the State Labor Bureaus in the United States, giving the name of commissioner, or chief official, at each bureau, with date and period of their service, from 1869 to 1898; and a full list of such bureaus located in foreign countries, giving name, official title, and post-office address of the chief official in each country; also a list of the several United States and territories, with their capitals where public libraries are situated. We exchange reports with them all.

The secretary reported the following states and territories having Bureaus of Labor Statistics, or kindred offices or departments. For each state or territory there is given the title of the office, the date of its establishment, the method of publishing its regular reports (annually or biennially), the title of the executive officer in charge, the name of the present incumbent, and his post-office address:

United States Department of Labor—Established as Bureau of Labor, January 31, 1885; made a Department of Labor June 13, 1888. Annual reports. Commissioner of Labor, Carroll D. Wright, Washington, D. C.

Massachusetts Bureau of Statistics of Labor—Established June 23, 1869. Annual reports. Chief of the Bureau of Statistics of Labor, Horace G. Wadlin, Boston, Mass.

Pennsylvania Bureau of Industrial Statistics—Established April 12, 1872. Annual reports. Chief of Bureau of Industrial Statistics, James M. Clark, Harrisburg, Pa.

Connecticut Bureau of Labor Statistics—Established July 12, 1873. Abolished July 23, 1875. Re-established April 23, 1885. Annual reports. Commissioner of Labor, Samuel B. Horne, Hartford, Conn.

Kentucky Bureau of Agriculture, Labor, and Statistics—First established March 20, 1876, as a Bureau of Agriculture, Horticulture, and Statistics; the duties of the bureau were enlarged and present name adopted April 2, 1892. Biennial reports. Commissioner of Agriculture, Labor, and Statistics, Lucas Moore, Frankfort, Ky.

Missouri Bureau of Labor Statistics and Inspection—Established March 19, 1879; enlarged March 23, 1883. Annual reports. Commissioner of Labor, Arthur Rozelle, Jefferson City, Mo.

Ohio Bureau of Labor Statistics—Established May 5, 1877. Annual reports. Commissioner of Labor, William Ruehrwein, Columbus, Ohio.

New Jersey Bureau of Statistics of Labor and Industries—Established March 27, 1878. Annual reports. Chief of the Bureau of Statistics of Labor and Industries, Charles H. Simmerman, Trenton, N. J.

Illinois Bureau of Labor Statistics—Established May 29, 1879. Biennial reports. Secretary of the Bureau of Labor Statistics, David Ross, Springfield, Ill.

Indiana Bureau of Statistics—Established March 29, 1879. Biennial reports. Chief of the Bureau of Statistics, John B. Conner, Indianapolis, Ind.

New York Bureau of Labor Statistics—Established May 4, 1883. Annual reports. Commissioner of Labor, John T. McDonough, Albany, N. Y.

California Bureau of Labor Statistics—Established March 3, 1883. Biennial reports. Commissioner of Labor, E. L. Fitzgerald, San Francisco, Cal.

Michigan Bureau of Labor and Industrial Statistics—Established June 6, 1883. Annual reports. Commissioner of Labor, Joseph L. Cox, Lansing, Mich.

Wisconsin Bureau of Labor Statistics—Established April 3, 1883. Biennial reports. Commissioner of Labor, Halford Erickson, Madison, Wis.

Iowa Bureau of Labor Statistics—Established April 3, 1884. Biennial reports. Commissioner of Labor, W. E. O'Bleness, Des Moines, Iowa.

Maryland Bureau of Industrial Statistics—Established March 27, 1884. Annual reports. Chief of the Bureau of Industrial Statistics, Chas. H. Myers, Baltimore, Md.

Kansas Bureau of Labor Statistics—Established March 5, 1885. Annual reports. Commissioner of Labor, W. L. A. Johnson, Topeka, Kan.

Rhode Island Bureau of Labor Statistics—Established March 29, 1887. Annual reports. Commissioner of Labor, Henry E. Tiepke, Providence, R. I.

Nebraska Bureau of Labor and Industrial Statistics—Established March 31, 1887. Biennial reports. The Governor, *ex-officio* Commissioner. Deputy Commissioner of Labor and Industrial Statistics, J. H. Powers, Lincoln, Neb.

North Carolina Bureau of Labor Statistics—Established February 28, 1887. Annual reports. Commissioner of Labor, James Y. Hamrick, Raleigh, N. C.

Maine Bureau of Labor Statistics—Established March 7, 1887. Annual reports. Commissioner of Labor, Samuel W. Matthews, Augusta, Maine.

Minnesota Bureau of Labor—Established as a Bureau of Labor Statistics March 8, 1887; enlarged and changed to Bureau of Labor, April, 1893. Biennial reports. Commissioner of Labor, L. G. Powers, St. Paul, Minn.

Colorado Bureau of Labor Statistics—Established March 24, 1887. Biennial reports. Commissioner of Labor, W. H. Klett, Denver, Col.

West Virginia Bureau of Labor—Established February 22, 1889. Annual reports. Commissioner of Labor, I. V. Barton, Wheeling, W. Va.

North Dakota Department of Agriculture and Labor—Established October 1, 1890. Biennial reports. Commissioner of Labor, H. U. Thomas, Bismarck, N. D.

Utah Bureau of Statistics—Established March 13, 1890. Annual reports. Territorial Statistician, Joseph P. Bache, Salt Lake City, Utah.

Tennessee Bureau of Labor Statistics and Mines—Established March 23, 1891. Annual reports. Commissioner of Labor, A. D. Hargis, Nashville, Tenn.

Montana Bureau of Agriculture, Labor, and Industry—Established February 17, 1893. Annual reports. Commissioner of Labor, J. H. Calderhead, Helena, Mont.

New Hampshire Bureau of Labor—Established March 30, 1893. Biennial reports. Commissioner of Labor, Julian F. Trask, Concord, N. H.

Washington Bureau of Labor—Established June 11, 1897. Annual reports. Commissioner of Labor, W. P. C. Adams, Olympia, Wash.

CHRONOLOGY OF UNITED STATES BUREAUS.

STATE.	When organized.	CHIEF OFFICER.	YEARS OF SERVICE.	
			Date.	Years.
United States	1884	Carroll D. Wright	1885–1897	12
Arkansas	1889	M. F. Locke	1889–1893	4
		W. G. Vincenheller	1893–	4
California	1883	John S. Enos	1883–1887	4
		John J. Tobin	1887–1891	4
		George W. Waltz	1891–1895	4
		E. L. Fitzgerald	1895–	3
Colorado	1887	C. J. Driscoll	1887–1889	2
		John W. Lockin	1889–1891	2
		Lester Bodine	1891–1893	2
		J. W. Brentlinger	1893–1895	2
		W. H. Klett	1895–	2
Connecticut	1873	James F. Babcock	1873–1874	1
		Samuel J. Starr*	1874–1875	1
		Arthur T. Hadley	1885–1887	2
		Samuel L. Hotchkiss	1887–1893	6
		Robert J. Vance	1893–1895	2
		S. B. Horne	1895–	2
Illinois	1879	F. H. B. McDowell	1879–1881	2
		John S. Lord	1881–1893	12
		George A. Schilling	1893–1897	4
		David Ross	1897–	1
Indiana	1879	John Collett	1879–1881	2
		John B. Connor	1881–1883	2
		William A. Peele, Jr	1883–1895	12
		Samuel J. Thompson	1895–1897	2
		John B. Conner	1897–	1
Iowa	1884	E. R. Hutchins	1884–1890	6
		J. R. Sovereign	1890–1894	4
		W. E. O'Bleness	1894–	4
Kansas	1885	Frank H. Betton	1885–1893	8
		J. F. Todd	1893–1895	2
		William G. Bird	1895–1897	2
		W. L. A. Johnson	1897–	1
Kentucky	1876	C. E. Bowman		
		C. V. Wilson		
		Nicholas McDowell	1892–1896	4
		Lucas Moore	1896–1897	1
Maine	1887	Samuel W. Matthews	1887–	11
Maryland	1884	Thomas C. Weeks	1884–1892	8
		Allen B. Howard, Jr	1892–1896	4
		Charles H. Myers	1896–	2
Massachusetts	1869	Henry K. Oliver	1869–1873	4
		Carroll D. Wright	1873–1888	15
		Horace G. Wadlin	1888–	10
Michigan	1883	John W. McGrath	1883–1885	2
		C. R. V. Pond	1885–1887	2
		A. H. Heath	1887–1891	4
		Henry A. Robinson	1881–1893	2
		Charles H. Morse	1893–1897	4
		Joseph L. Cox	1897–	1
Minnesota	1887	John Lamb	1887–1891	4
		J. P. McGanahen	1891–	
		L. G. Powers	1891–	7
Missouri	1879	W. H. Hillkene	1880–1882	2
		H. J. Spaunhurst	1882–1883	1
		H. A. Newman	1883–1885	2
		Oscar Kochtitzky	1885–1889	4
		Lee Meriwether	1889–1891	2
		Willard C. Hall	1891–1893	2
		Henry Blackmore	1893–1895	2
		Lee Meriwether	1895–1897	2
		Arthur Rozelle	1897–	1
Montana	1893	James H. Mills	1893–1897	4
		J. H. Calderhead	1897–	1
Nebraska	1878	John Jenkins	1887–1890	3
		Philip Andres	1891–1893	2
		J. B. Erion	1893–1895	2
		J. H. Powers	1895–	3
New Hampshire	1893	John W. Bourlet	1893–1896	3
		Julian F. Trask	1896–	2
New Jersey	1878	James Bishop	1878–1893	15
		Charles H. Simmerman	1893–	8
New Mexico	1891	Max Frost	1891–	7

CHRONOLOGY OF UNITED STATES BUREAUS.

STATE.	When organized.	CHIEF OFFICER.	YEARS OF SERVICE.	
			Date.	Years.
New York	1883	Charles F. Peck	1883-1893	10
		Thomas J. Dowling	1893-1896	3
		John T. McDonough	1896-	2
North Carolina	1887	W. N. Jones	1887-1889	2
		John C. Scarborough	1889-1893	4
		B. R. Lacy	1893-1897	4
		James Y. Hamrick	1897-	1
North Dakota	1889	H. T. Helgensen	1889-1893	4
		Nelson Williams	1893-1895	2
		A. H. Laughlin	1895-1897	2
		H. U. Thomas	1897-	1
Ohio	1877	Henry J. Walls	1877-1881	4
		Henry Luskey	1881-1885	4
		L. McHugh	1885-1887	2
		A. D. Fassett	1887-1890	3
		John McBride	1890-1892	2
		W. T. Lewis	1892-1896	4
		William Reuhrwein	1896-	2
Pennsylvania	1872	Thomas J. Braham	1872-1875	3
		W. H. Grier	1875-1879	4
		M. S. Humphreys	1879-1883	4
		Joel B. McCamant	1883-1887	4
		Albert S. Bolles	1887-1895	8
		James M. Clark	1895-	3
Rhode Island	1887	Josiah B. Bowdich	1887-1889	2
		Almon K. Goodwin	1889-1893	4
		Henry E. Tiepke	1893-	4
South Dakota	1890	Frank Wilder	1890-1891	1
		Robert A. Smith	1891-1893	2
		Walter McKay	1893-1895	2
		S. A. Wheeler	1895-	2
Tennessee	1891	George W. Ford	1891-1893	2
		John E. Lloyd	1893-1895	2
		F. P. Clute	1895-1896	1
		A. H. Wood	1896-1897	1
		A. D. Harals	1897-	1
Texas	1879	V. O. King	1879-1881	2
		A. W. Skruaht	1881-1883	2
		H. P. Brewster	1883-1884	1
		H. P. Bee	1884-1887	3
		L. L. Foster	1887-1891	4
		J. E. Hollingsworth	1891-1895	4
		A. J. Rose	1895-	2
Utah		Joseph P. Bache	1890-	8
Washington	1897	W. C. P. Adams	1897-	1
Wisconsin	1883	Frank A. Flower	1883-1889	6
		H. M. Stark	1889-1891	2
		J. Dobbs	1891-1895	4
		Halford Erickson	1895-	3
West Virginia	1889	Edward Robinson	1889-1893	4
		John N. Sydenstricker	1893-1897	4
		I. V. Barton	1897-	1

FOREIGN BUREAUS OF STATISTICS OF LABOR.

In Belgium the Office du Travail (Ministere de l'Industrie et du Travail) was established in 1895 at Brussels, the official head of the office being entitled "Chef." A superior council of labor (conseil superieur du travail), which made investigations and reports on matters relating to labor, has been in existence since April 7, 1892. November 12, 1894, a separate labor bureau, similar to the American and French type, was created under the Department of Agriculture, Industry, and Public Works. But in 1895 this department was separated into two departments, known as Department of Agriculture and Public Works, and Department of Industry and Labor, and the newly created labor bureau was made a division under this latter department.

In France the Office du Travail (Ministère du Commerce, de l'Industrie, des Postes et des Telegraphes) was established July 21, 1891, at Paris, the official head of the office being entitled "Directeur." The publications of the bureau consist of special reports on particular subjects, of which a number are issued each year, and since January 1, 1894, a monthly bulletin, "Bulletin de l'Office du Travail."

In Germany the Kommission fuer Arbeiter Statistik was established June 1, 1891, at Berlin. This is a permanent commission, which issues special reports from time to time on particular questions and reports of the minutes of its meetings. The material collected by it is compiled by the Imperial Statistical Bureau.

In Great Britain the Labor Department of the Board of Trade was established in 1893 at London, the official head of the office being entitled "Commissioner." A service for the collection and publication of statistics of labor has been in existence under the Board of Trade since March 2, 1886. In 1893 this service was greatly enlarged and given its present name. Its reports, therefore, date from 1886-87, and consist of annual reports of operations and statistical abstracts, annual reports on strikes and lockouts, annual reports on trades unions, annual reports on wages (contemplated), special reports, and since May, 1893, a monthly "Labor Gazette."

In Switzerland the Secretariat Ouvrier Suisse was constituted December 20, 1886, at Berne. The "Secretariat" is an officer of the federation of labor organizations, but is subsidized by the government, which directs him to make certain reports. His publications consist of annual and special reports.

In Ontario, Canada, a bureau of industries was organized under the commissioner of agriculture, March 10, 1882, the official head of the

bureau being styled Secretary. Annual and occasional special reports are issued.

In New Zealand a bureau of industries was created in 1892. In the following year the designation of the bureau was changed to that of Department of Labor. Its publications consist of annual reports and a monthly journal commenced in March, 1893, under the title "Journal of Commerce and Labor," which after the issue of a few numbers was changed to that of "Journal of the Department of Labor."

We have been informed unofficially that an office for the collection of labor statistics has recently been established in Spain.

The above statement is believed to include information concerning all bureaus of foreign governments especially created for the collection and publication of statistics relating to labor. It is not a statement, however, of the extent to which foreign governments publish labor statistics, as a great deal of valuable information on this subject is contained in the publications of the central statistical bureaus or other offices of foreign governments.—*Bulletin of the United States Department of Labor, November, 1895.*

LIST OF FOREIGN BUREAUS OF STATISTICS OF LABOR, ETC.

ARGENTINE REPUBLIC.

Francois Latzina, Directeur Général de la Statistique de la Republique Argentina (Ministère de l'Intérieur), Buenos Ayres.

AUSTRALIA.

Department of Labor and Industry, Public Instruction Office, Sidney, New South Wales. T. B. Clegg, Esq., Clerk in charge.

AUSTRIA-HUNGARY.

Commission Central of Statistics (Minister of Public Instruction), Dr. Karl Theodor von Inama Sternegg, President, Vienna. Department of Municipal Statistics, Dr. Sedlatzek, Chief, Vienna.

BAVARIA.

Royal Bureau of Statistics (Department of the Interior). Karl Rasp, Director, Munich.

BELGIUM.

Royal Bureau of General Statistics (Minister of the Department of the Interior and Public Instruction). Edmond Nicoali, Chief, Brussels.

BRAZIL.

Dr. R. Pompeia, Directeur du Bureau de Statistique des Etats-Unis du Brésil (Ministère de l'Intérieur), Rio Janeiro.

BULGARIA.

Bureau of Statistics of Bulgaria (Minister of Public Instruction). F. Ivantchoff, Director, Sophia.

CANADA.

George Johnson, Government Statistician, Department of Agriculture, Statistics, and Health, Ottawa.

CHILI.

Don Francisco S. Asta Buruaga, Chef du Bureau Central de Statistique du Chili, Santiago.

DENMARK.

Royal Bureau of Statistics (Minister of Finance). Marius de Gad, Director, Copenhagen.

ENGLAND.

Robert Griffen, Comptroller General of the Commercial, Labor, and Statistical Departments of the Board of Trade, London.

FRANCE.

Office du Travail (Ministère du Commerce et de l'Industrie). C. Moron, Directeur, Paris.

Victor Furquan, Chef du Bureau de la Statistique Général de France (Ministère du Commerce et de l'Industrie—Office du Travail), Paris.

GERMANY.

Imperial Office of Statistics (Department of the Interior). Dr. F. W. Hans von Scheel, Director, Berlin.

HERZEGOVINA.

Bureau of Statistics of Bosnia and Herzegovina. Dr. Ferdinand Schmid, Director, Sarajevo.

ITALY.

Luiai Bodio, Directeur Général de la Statistique du Royaume (Ministère de l'Agriculture, de l'Industrie et du Commerce), Rome.

JAPAN.

S. Ishibashi, Chef du Bureau Général de Statistique (Cabinet Imperial), Tokio.

MEXICO.

Antonio Penafiel, Directeur Général de la Statistique de la République (Mexicaine du Fomento), Mexico.

NEW ZEALAND.

Department of Labor. I. H. Richardson, Commissioner, Office of Government Statistician, Wellington.

PARAGUAY.

I. Jasquet, Directeur Général de la Statistiane du Paraguay, Assumption.

PORTUGAL.

Ernesto Maderia Pinto, Director General of Statistics of Commerce (Minister of Public Works, or Commerce and Industries), Lisbon.

PRUSSIA.

Royal Bureau of Statistics (Minister of the Department of the Interior). Karl Julius Emil Blenck, Director, Berlin.

Office of Statistics of the City of Berlin. Dr. Richard Bockh, Director, Berlin.

ROUMANIA.

C. E. Curpenski, Directeur de la Statistique Général du Rouaume (Ministère de l'Agriculture, de l'Industrie, du Commerce et des Domaines), Bucharest.

RUSSIA.

Nicholas Troinitsky, Directeur du Comite Central de Statistique (Ministère de l'Intérieur), St. Petersburg.

B. Grigorier, Chef du Bureau de la Statistiane Municipale, Moscow.

SAXONY.

Bureau of Statistics of the Minister of State. Dr. Victor Bohmert, Director, Dresden.

SPAIN.

Ing. Francisco de Paula de Arrillaga, Director General of the Geographic Institute and Bureau of Statistics of Spain, Madrid.

STYRIA.

Bureau of Statistics of Styria. Dr. Ernst Meschler, Director, Gratz.

SWEDEN AND NORWAY.

Dr. Elis Sidenbladh, Directeur en Chef du Bureau Central de Statistique du Royaume (Ministère de l'Intérieur), Stockholm.

Anders Nicoali Kiaer, Directeur du Bureau Central de Statistique du Royaume (Ministère de l'Intérieur), Christiania.

SWITZERLAND.

Dr. Louis Guillaume, Directeur du Bureau Federal de Statistiane (Ministère de l'Intérieur), Berne.

URUGUAY.

Honore Roustan, Directeur du Bureau de la Statistique Général, Montevideo.

LIBRARY STATISTICS.

STATE LIBRARIES.

States and Territories.	Capitals.	States and Territories.	Capitals.
Alabama	Montgomery	Montana	Helena.
Alaska	Sitka	Nebraska	Lincoln.
Arizona	Phœnix	Nevada	Carson City.
Arkansas	Little Rock	New Hampshire	Concord.
California	Sacramento	New Jersey	Trenton.
Colorado	Denver	New Mexico	Santa Fé.
Connecticut	Hartford	New York	Albany.
Delaware	Dover	North Carolina	Raleigh.
District of Columbia.	Washington	North Dakota	Bismarck.
Florida	Tallahassee	Ohio	Columbus.
Georgia	Atlanta	Oklahoma	Guthrie.
Idaho	Boisé City	Oregon	Salem.
Illinois	Springfield	Pennsylvania	Harrisburg.
Indiana	Indianapolis	Rhode Island	Providence.
Indian Territory	Tahlequah	South Carolina	Columbia.
Iowa	Des Moines	South Dakota	Pierre.
Kansas	Topeka	Tennessee	Nashville.
Kentucky	Frankfort	Texas	Austin.
Louisiana	Baton Rouge	Utah	Salt Lake City.
Maine	Augusta	Vermont	Montpelier.
Maryland	Annapolis	Virginia	Richmond.
Massachusetts	Boston	Washington	Olympia.
Michigan	Lansing	West Virginia	Charleston.
Minnesota	St. Paul	Wisconsin	Madison.
Mississippi	Jackson	Wyoming	Cheyenne.
Missouri	Jefferson City		

NEW HAMPSHIRE LIBRARIES.

NAME OF LIBRARY.	Date of establishment.	Town or City.	No of Vols.	Appropriated for year.	Location of the Library.
Silsby Free Public	1892	Acworth	2,047	$46.20	Library building.
Haynes	1885	Alexandria	1,139	.....	Library building.
Public	1833	Allenstown	555	83.70	Dwelling-house.
Town	1875	Alstead	730	75.00	Town hall.
Free Public	1892	Alton	1,688	137.00	Town hall.
Town	1888	Amherst	2,795	200.00	Library building.
Andover	1892	Andover	1,114	100.00	Academy building.
Proctor Academy	.....	"	1,486	.....	Academy building.
Free Public	1892	Antrim	905	200.00	Town building.
Town	1871	Ashland	2,661	140.000	Town building.
Free Public	1894	Atkinson	663	125.00	Dwelling-house.
Academy	.....	"	1,600	.....	Academy building.
Griffin	1892	Auburn	716	43.80	Library building.
Free Public	1892	Barnstead	730	104.00	Store building.
Social	1895	Barrington	542	.....	.....
Free Public	1893	Bartlett	325	40.00	Store building.
Free Public	1893	Bath	879	110.00	Dwelling-house.
Public	1887	"	570	.....	Dwelling-house.
Public	1893	Bedford	693	125.60	Chapel.
Public	1893	Belmont	1,159	150.00	Town building.
Public	1832	Bennington	1,301	63.10	Town hall.
Public	1894	Benton	183	15.00	Store building.
Free Public	1893	Berlin	3,513	500.00	Library rooms.
Association	1877	Bethlehem	1,730	.....	Library rooms.
Town	1893	Boscawen	483	100.00	Town hall.
Free (Assessment)	.....	Bow	.....	70.50	.....
Free	1892	Bradford	1,358	75.00	Dwelling-house.
Public	1893	Brentwood	957	42.30	Dwelling-house.
Assessment	.....	Bridgewater	.....	17.10	.....
Minot-Sleeper	1884	Bristol	3,775	465.00	Library building.
Public	1893	Brookfield	480	18.00	Town hall.
Public	1877	Brookline	1,550	50.00	Store building.
Free	1893	Campton	402	51.00	Town hall.
Town	1892	Canaan	664	77.40	Dwelling-house.
Harris Free Public	1892	"	575	.....	Goodhue, D. H.
East Canaan	1871	"	629	.....	.....
Smyth Public	1888	Candia	1,286	75.00	Dwelling-house.
Town	1893	Canterbury	491	75.00	Town hall.
Social Shaker	1897	"	559	.....	Town hall.
Twin Mountain	1892	Carroll	348	83.00	Dwelling-house.
Center Harbor	1889	Center Harbor	935	.....	Dwelling-house.
Assessment	.....	"	.....	36 60	.....
Silsby Free Public	1894	Charlestown	3,979	400.00	Library building.
Assessment	.....	Chatham	.....	9.60	.....
Free Public	1894	Chester	2,268	100.00	Library building.
Free Public	1894	Chesterfield	795	100.00	Dwelling-house.
Fisk Free	1873	Claremont	7,233	250.00	Town building.
High School	.....	"	800	.....	.....
Free Public	1896	Clarksville	110	25.00	Dwelling-house.
Public	1891	Colebrook	4,350	300.00	Store building.
Public	1896	Columbia	110	29.70	Dwelling-house.
Public	1855	Concord	21,807	6,000.00	Library building.
St. Paul's School	1861	"	11,069	.....	S. P. S. building.
Y. M. C. A	1885	"	410	.....	Y. M. C. A. building.
State Library	.....	"	38,445	.....	State building.
N. H. Hist. Society	.....	"	15,000	.....	Historical building.
Dept. Public Ins'n	.....	"	700	.....	State building.
Board of Health	.....	"	500	.....	State building.
N. H. Asylum	.....	"	1,969	.....	Asylum building.
North Conway Public	1887	Conway	2,147	.....	Library building.

NEW HAMPSHIRE LIBRARIES.

NAME OF LIBRARY.	Date of establishment.	Town or City.	No. of Vols.	Appropriated for year.	Location of the Library.
Free Public	1894	Cornish	547	$60.00	Dwelling-house.
Town	1894	Croydon	325	26.70	Store building.
Free Public	1892	Dalton	781	18.00	Town hall.
George Gamble	1888	Danbury	570	40.00	Town hall.
Public	1892	Danville	691	100.00	Town hall.
Philbrick-James	1880	Deerfield	2,264	25.00	Town hall.
Town	1876	Derry	.....	.....	Town hall.
School	.....	"	4,114	.....	Pinkerton academy.
Public	1883	Dover	23,226	3,500.00	City hall.
Y. M. C. A.	1888	"	512	.....	Y. M. C. A. rooms.
Public	1884	Dublin	3,262	100.00	Town hall.
Assessment	.....	Dummer	.....	13.80	.....
Free	1893	Dunbarton	900	57.60	Town hall.
Public	1893	Durham	5,677	425.00	Library building.
College	1868	"	4,000	.....	N. H. Col. of A. and M. A.
Free Public	1894	East Kingston	496	27.00	Dwelling-house.
Free Public	1892	Easton	257	15.00	Dwelling-house.
Free Public	1893	Eaton	382	15.00	Hotel building.
Free Public	1894	Effingham	1,126	26.40	Town hall.
Public	1892	Enfield	1,846	100.00	Dwelling-house.
Free Public	1893	Epping	809	175.00	Town hall.
Public	1893	Epsom	708	50.70	Dwelling-house.
Free Public	1892	Errol	379	15.30	Dwelling-house.
Public	1853	Exeter	10,975	2,000.00	Library building.
Phillips Exeter Acad.	1781	"	2,000	.....	Academy building.
Robinson Seminary	1869	"	1,150	.....	Seminary building.
Public	1896	Farmington	2,114	186.60	Town building.
Town	1873	Fitzwilliam	5,100	75.00	Town hall.
Town	1873	Francestown	2,880	100.00	Library hall.
Academy	1864	"	300	.....	Academy building.
Free Public	1893	Franconia	1,530	150.00	Town building.
Dow Academy	.....	"	300	.....	Academy building.
Smith	1880	Franklin	2,900	.....	.....
Franklin	1864	"	3,100	.....	Chapel.
High School	.....	"	250	.....	School building.
Orphans' Home	.....	"	300	.....	Orphans' home.
Free Public	1892	Freedom	533	34.20	Town hall.
Public	1894	Fremont	947	75.00	Library building.
Public	1894	Gilford	620	100.00	Dwelling-house.
Public	1696	Gilmanton	110	76.26	Post-office.
Public	1892	Gilsum	1,098	75.00	Dwelling-house.
Rogers Free Public	1888	Goffstown	2,085	183.60	Town hall.
Public	1895	Gorham	795	300.00	Store building.
Olive Y. Pettis Free	1890	Goshen	707	25.00	Store building.
Free Public	1892	Grafton	500	45.90	Library building.
Free	1892	Grantham	618	19.80	Town hall.
Public	1894	Greenfield	537	44.40	Town building.
Public	1896	Greenland	110	56.10	Town hall.
Chamberlin Public	1879	Greenville	2,687	300.00	Town hall.
Free Public	1892	Groton	387	15.90	Dwelling house.
Nelson Ordway Pub.	1889	Hampstead	1,502	150.00	Library building.
Public	1882	Hampton	21,402	100.00	Town hall.
Public	1892	Hampton Falls	1,215	50.00	Town hall.
Ladies' Social	1884	"	1,020	.....	Church building.
Town	1860	Hancock	3,461	.....	Library building.
Dartmouth	1770	Hanover	82,000	.....	Dartmouth college.
Town	1878	Harrisville	1,725	50.00	Library building.
Library Association	1880	Haverhill	1,280	.....	.....
Assessment	.....	"	.....	165.30	.....
Ladies' Social	.....	Hebron	492	.....	.....

NEW HAMPSHIRE LIBRARIES.

NAME OF LIBRARY.	Date of establishment.	Town or City.	No. of Vols.	Appropriated for year.	Location of the Library.
Social	.....	Hebron	400	.....	.....
Free	1889	Henniker	2,461	$200.00	Store building.
Public	1893	Hill	1,205	50.00	Academy hall.
Fuller Public	1877	Hillsborough	4,115	194.50	Store building.
Town	1875	Hinsdale	5,425	400.00	Town hall.
Free	1893	Holderness	892	30.00	Rented building.
School	1879	"	1,700	.....	School building.
Social	1879	Hollis	4,697	150.00	Town building.
High School	.....	"	200	.....	School building.
Public	1893	Hooksett	472	125.00	Town hall.
Free Public	1892	Hopkinton	3,841	300.00	Memorial building.
Greeley Public	1894	Hudson	2,366	100.00	Store building.
Free Public	1880	Jackson	2,300	28.20	Town hall.
Public	1893	Jaffrey	2,378	200.00	Library building
Free Public	1894	Jefferson	940	60.00	Library building.
Public	1875	Keene	10,310	1,350.00	City building.
Free Public	1893	Kensington	370	75.00	Library building.
Social	1895	"	946	.....	Library building.
Seminary	1888	Kingston	1,942	.....	Seminary building.
Public	1894	"	957	90.00	Town hall.
Public	1878	Laconia	6,488	1,000.00	Bank building.
Lakeport Public	1892	"	2,068	.....	Store building.
Public	1884	Lancaster	6,450	400.00	Library building.
Public	1893	Landaff	197	33.30	Dwelling-house.
Free Public	1889	Langdon	425	33.90	Post-office building.
Public	1889	Lebanon	5,500	500.00	Memorial building.
West Lebanon	1869	"	1,236	.....	School building.
Public	1892	Lee	740	48.30	Town hall.
Free Public	1893	Lempster	986	50.00	Town hall.
Assessment	.....	Lincoln	.....	29.40	.....
Village Library	1864	Lisbon	2,566	.....	Association building.
Assessment	.....	"	.....	130.50	.....
Public	1892	Litchfield	825	37.20	Library building.
Public	1889	Littleton	6,438	600.00	Town building.
Assessment	.....	Livermore	.....	38.10	.....
Leach	1879	Londonderry	2,681	100.00	Town hall.
Suncook	.....	Loudon	300	.....	Dwelling-house.
Free Public	1894	Lyman	864	21.60	Dwelling-house.
Turner Social	.....	Lyme	3,150	.....	.....
Public	1894	Lyndeborough	1,486	75.00	R. R. Station.
Franklin	1851	"	400	.....	Store building.
Free Public	1893	Madison	397	48.10	Dwelling-house.
Silver Lake	1885	"	250	.....	Hotel building.
City	1854	Manchester	41,079	4,500.00	Library building.
Art Association	1871	"	640	.....	.....
Industrial School	1858	"	600	.....	State Ind. School build'g.
Frost Free	1865	Marlborough	4,950	.....	Library building.
Town	1886	Marlow	1,096	60 60	Store building.
Free Public	1882	Mason	403	40.50	Store building.
Public	1892	Meredith	2,371	250.00	Store building.
Public	1892	Merrimack	1,467	225.00	Dwelling-house.
McGaw Institute	1876	"	600	.....	.....
Free Town	1892	Middleton	621	15.90	Dwelling-house.
Public	1896	Milan	110	50.00	Store building.
Free	1868	Milford	7,297	1,000.60	Library building.
Free Public	1893	Milton	485	92.70	Store building.
Nute	1890	"	1,710	.....	Nute building.
Circulating	1889	"	200	.....	.....
Free Public	1896	Monroe	108	30.00	Dwelling-house.
Free Public	1893	Mont Vernon	561	50.00	Academy building.

NEW HAMPSHIRE LIBRARIES.

NAME OF LIBRARY.	Date of establishment.	Town or City.	No. of Vols.	Appropriated for year.	Location of the Library.
Appleton	1850	Mont Vernon	175	.....	Academy building.
Free Public	1896	Moultonborough	110	$100.00	Rented building.
Public	1867	Nashua	16,597	4,000.00	Store building.
Free Public	1892	Nelson	954	21.00	Town hall.
Whipple Free	1888	New Boston	1,748	.....	Store building.
Free Public	1892	Newbury	443	50.00	Rented quarters.
Assessment	.....	Newcastle	.....	33.90	.....
Public	1894	New Durham	122	31.20	Dwelling-house.
W. C. T. U.	1889	"	300	.....	.....
Free Public	1893	Newfields	1,534	100.00	Store building.
Gordon-Nash	1896	New Hampton	1,000	.....	Library building.
Langdon	1893	Newington	2,264	15.00	Library building.
New Ipswich	1895	New Ipswich	2,497	300.00	Library building.
Public	1896	New London	110	55.50	Rented rooms.
Colby Academy	.....	"	2,706	.....	Academy building.
Town	1875	Newmarket	4,000	300.00	Library building.
Richards Free	1888	Newport	5,390	.....	Library building.
Public	1893	Newton	914	100.00	Town hall.
Public	1892	North Hampton	700	100.00	Town hall.
Public	1884	Northumberland	700	69.90	Store building.
Public	1878	Northwood	471	80.00	Dwelling-house.
Coe's Academy	1870	"	962	.....	.....
Seminary	1893	"	479	.....	.....
Public	1893	Nottingham	479	34.70	Town hall.
Free Public	1893	Orange	244	15.00	Dwelling-house.
Free	1892	Orford	209	47.40	Dwelling-house.
Circulating	1890	"	1,059	.....	Store building.
Reading Library	1882	Ossipee	512	.....	Store building.
Free Public	1893	Pelham	1,324	100.00	Library building.
Public	1896	Pembroke	110	375.80	Store building.
Pentagon	1875	"	1,262	.....	Store building.
Academy	1839	"	2,500	.....	Academy building.
Town	1833	Peterborough	9,058	800.00	Library building.
Free Public	1893	Piermont	491	39.00	Town hall.
Free Public	1893	Pittsburg	321	36.00	Dwelling-house.
Assessment	.....	Pittsfield	.....	174.00	.....
Free Public	1893	Plainfield	667	72.30	Town hall.
Kimball Union	1813	"	2,362	.....	K. U. academy.
Public	1896	Plaistow	110	88.70	Town hall.
Assessment	.....	Plymouth	.....	241.90	.....
Young Ladies'	1873	"	3,088	.....	Old court house.
State Normal	.....	"	2,810	.....	.....
Free Public	1881	Portsmouth	13,300	2,000.00	Rented building.
Athenæum	1817	"	15,500	.....	.....
Public	1893	Randolph	394	15.00	Dwelling-house.
Free Public	1893	Raymond	210	100.00	Store building.
Public	1892	Richmond	1,093	50.00	Town hall.
Ingalls Memorial	1893	Rindge	2,500	25.00	Library building.
West Rindge	1884	"	1,059	.....	Dwelling-house.
East Rindge	1871	"	1,210	.....	Dwelling-house.
Public	1893	Rochester	5,506	1,500.00	City building.
East Rochester	1885	"	2,185	150.00	Library building.
Circulating	.....	"	600	.....	Store building.
Public	1892	Rumney	2,104	49.20	Town Hall.
Free Public	1894	Salem	1,506	125.00	Library building.
Free	1896	Salisbury	110	43.20	.....
Public	1893	Sandown	344	21.00	Store building.
Assessment	.....	Sandwich	.....	57.30	.....
Sandwich	1883	"	1,256	.....	Masonic building.
Brown Memorial	1892	Seabrook	2,694	.....	Library building.

NEW HAMPSHIRE LIBRARIES.

NAME OF LIBRARY.	Date of establishment.	Town or City.	No. of Vols.	Appropriated for year.	Location of the Library.
Public	1894	Sharon	490	$15.00	Dwelling-house.
Public	1894	Shelburne	439	16.50	Store building.
Assessment	.....	Somersworth	.....	415.20	.....
Manuf. and Village	1840	"	10,570	.....	Chandler building.
Free	1892	South Hampton	1,520	50.00	Town hall.
Town	1892	Springfield	107	20.40	Store building.
Public	1873	Stark	1,565	50.00	Town hall.
Assessment	.....	Stewartstown	.....	42.00	.....
Subscription	.....	"	400	.....	.....
Free Public	1892	Stoddard	525	29.10	Town hall.
Free Public	1893	Strafford	269	69.90	Dwelling-house.
Public	1896	Stratford	310	56.70	Dwelling-house.
Subscription	1884	"	350	.....	.....
Town	1896	Stratham	668	75.00	Store building.
Free Public	1893	Sullivan	209	25.00	Dwelling-house.
Union	1885	"	283	.....	.....
Town	1892	Sunapee	412	54.90	.....
Reed Free	1891	Surry	3,014	63.00	Town building.
Town	1868	Sutton	635	51.00	Town building.
Stratton Free	.....	Swanzey	3,200	.....	.....
Mount Cæsar	1885	"	2,771	.....	Library building.
Free Public	1893	Tamworth	1,134	100.00	Library building.
Chocorua Public	1888	"	875	.....	Dwelling-house.
Wonalancet	1892	"	350	.....	.....
Town	1892	Temple	2,290	50.00	Library building.
Assessment	.....	Thornton	.....	22.50	.....
T. and N. Public	1893	Tilton	5,250	250.00	Library building.
N. H. Con. Sem	1845	"	3,200	.....	N. H. C. Sem. building.
Town	1892	Troy	679	70.00	Town hall.
Assessment	.....	Tuftonborough	.....	31.50	.....
Free	1892	Unity	511	30.30	Dwelling-house.
Public	1879	Wakefield	1,902	.....	Library building.
Free	1882	"	1,002	.....	Store building.
Bridge Memorial	1854	Walpole	6,139	460.00	Library building.
Pillsbury Free	1891	Warner	6,217	450.00	Library building.
Public	1893	Warren	848	50.00	Dwelling-house.
Shedd Free	1869	Washington	3,118	29.52	Library building.
Free	1892	Waterville	295	15.60	Dwelling-house.
Free	1892	Weare	880	125.00	Memorial building.
Free Public	1893	Webster	519	75.00	Store building.
Public	1895	Wentworth	847	50.00	Rented building.
Free	1887	Westmoreland	1,427	79.80	Dwelling-house.
Public	1893	Whitefield	3,526	300.00	Town hall.
Assessment	.....	Wilmot	.....	54.00	.....
Public	1890	Wilton	5,117	300.00	Town hall.
Public	1875	Winchester	6,840	500.00	Library building.
Nesmith	1870	Windham	3,209	.....	Town hall.
Assessment	.....	Windsor	.....	5.40	.....
Brewster Free	1890	Wolfeborough	6,410	.....	Brewster hall.
Moosilauke	1893	Woodstock	623	44.70	Hotel building.

LABOR LAW DECISIONS.

LABOR LAW DECISIONS.

DECISIONS UNDER STATUTORY LAW.

CRIMINAL CONSPIRACY—TRADE UNIONS.—*People v. Davis et al., Chicago Legal News, Vol. XXX., No. 26, page 212.*—The defendants were indicted for criminal conspiracy under section 46 of chapter 38 of the Revised Statutes of Illinois of 1891, and the case was heard in the criminal court of Cook county, Ill., upon a motion to quash the indictment. Section 46 of chapter 38 of the Revised Statutes reads, in so far as it is applicable to this case, as follows:

If any two or more persons conspire or agree together with the fraudulent or malicious intent wrongfully and wickedly to injure the person, character, business, or employment or property of another . . . they shall be deemed guilty of a conspiracy, and every such offender, whether as individuals, or as officers of any society or organization, and every person convicted of conspiracy at common law shall be imprisoned in the penitentiary not exceeding five years, or fined not exceeding two thousand dollars, or both.

Section 158 of chapter 38 of the Revised Statutes of 1891, the effect of which was considered by the court in its decision, reads as follows:

If any two or more persons shall combine for the purpose of depriving the owner or possessor of property of its lawful use and management, or of preventing, by threats, suggestions of danger, or any unlawful means, any person from being employed by or obtaining employment from any such owner or possessor of property, on such terms as the parties concerned may agree upon, such persons so offending shall be fined not exceeding $500, or confined in the county jail not exceeding six months.

The decision of the court was rendered February 11, 1898, and the motion to quash the indictment was allowed. The opinion was delivered by Judge Baker, and the following, sufficiently showing the facts in the case, is quoted therefrom:

This is a motion to quash an indictment against four defendants, which is found under and intended to charge a violation of section 46 of the Criminal Code [Sect. 46 of chap. 38 of the R. S. of Ill. of 1891].

The first count of the indictment charges that the defendants were members of a certain union, viz., the Hoisting Engineers' Association; that Charles and Dennis were in the employ of the Thomas Elevator Company; that the defendants did, unlawfully, etc., conspire and agree together with the fraudulent and malicious intent to wrongfully and wickedly injure the business of Charles and Dennis by unlawfully, etc., demanding of said elevator company the discharge of Charles and Dennis for the reason to be represented to said elevator company by the

defendants; that Charles and Dennis were not members of said association, and then to "call off" certain engineers in the employ of said elevator company who were members of said association, if said demand was not complied with "for the purpose then and there of stopping the work of said Thomas Elevator Company, and thus throw said Charles and Dennis out of their employments." It then avers the execution of said agreement, demand, refusal, "calling off" of the union engineers by defendants, and avers that thereby the work of said elevator company was stopped, and by reason thereof, said Charles and Dennis discharged from their employment.

The second and third counts are identical with the first, save that the intent alleged in the second is to injure the "employment," in the third the "business and employment" of Charles and Dennis.

It is not alleged that any contract of employment for any period existed either between the elevator company and the union engineers, or between that company and Charles and Dennis.

To constitute an offense under the provisions of section 46, above quoted, there must be the agreement, with the fraudulent or malicious intent, "wrongfully and wickedly" to injure the business or employment, etc., of another. The agreement with the fraudulent or malicious intent to injure is not enough. The agreement must include the purpose to carry into execution the fraudulent and malicious intent to injure "wrongfully and wickedly," that is, by the use of wrongful and wicked means. It may be that an indictment in the words of the statute charging that the defendants did conspire and agree together with the fraudulent and malicious intent wrongfully and wickedly to injure Charles and Dennis in their employment would be sufficient, but in this indictment there is a precise statement of the means agreed upon by the defendants to be used to carry into effect their alleged malicious intent to injure Charles and Dennis in their employment; and hence, if the means so alleged to have been agreed upon are in law wrongful and wicked, the indictment well and sufficiently charges a conspiracy under the statute. And, on the other hand, if the measures so set out in the indictment are not wrongful and wicked, the indictment can not be held well and sufficiently to charge a conspiracy under the statute, for, if the means which the indictment alleges were agreed upon to be used are not wrongful and wicked, in no just sense can the indictment be held to charge a conspiracy and agreement by the defendants with the fraudulent and malicious intent, "wrongfully and wickedly" to injure Charles and Dennis.

The words "wrongfully and wickedly" in the statute are to be understood as meaning the use of things in themselves "wrongful and wicked," independently of combination. We can not say that the means are wrongful and wicked, because of the agreement to use such means to carry out a malicious intent to injure. The thing prohibited is an agreement with the malicious intent wrongfully and wickedly to injure. Whether such intent exists depends upon the means agreed upon to be used to carry out the malicious intent to injure. To say that the means agreed upon are wrongful and wicked because of the agreement to use such means to carry out the malicious intent to injure, amounts

to saying that the means receive a character of wrongfulness and wickedness from the agreement to use such means in a manner which depends for its own wrongfulness and wickedness upon the means so agreed upon.

I shall not attempt to define the words "wrongfully or wickedly" as used in the statute. It is sufficient to say that in cases like this where there is no suggestion of fraud, immorality, injury to the public, or violation of contract, there must at least be a civil wrong, and invasion of the civil right of another, carrying with the liability to repair the natural and direct consequences, where injury results to the person whose rights are infringed or invaded. If the acts which the indictment alleges the defendants agreed together to do to compass the discharge of Charles and Dennis with the malicious intent to injure them constitute an actionable civil wrong, they must be regarded as wrongful and wicked in law, and if they do not amount to a civil wrong and are not criminal, they can not be regarded as wrongful and wicked in law.

The judge here cites and quotes from an English case, Allen *v.* Flood, 42 Solicitors' Journal, 149, and then says:

The legal principle settled by the case is that the existence of a bad motive will not convert an act, which is not of itself illegal, into a civil wrong. The test laid down to determine what act of members of trades unions of the nature here under consideration are innocent, and what wrongful, is that if the members of a union resort to unlawful acts they may be indicted or sued. If they do not resort to unlawful acts, they are entitled to further their interests in the manner which seems to them best and most likely to be effectual, and both are to my mind correct and salutary rules. The latter is, after all, but a restatement in different words of the rule laid down by Chief Justice Shaw, in 1842, in the case of Commonwealth *v.* Hunt, 4 Metcalf, 134, when he said: "The legality of such an association (a trades union) will therefore depend upon the means to be used for its accomplishment. If it is to be carried into effect by fair or honorable or lawful means, it is, to say the least, innocent; if by falsehood or force, it may be stamped as an illegal conspiracy." There is no suggestion, even in the indictment, that the agreement into which it is alleged the defendants entered, contemplated the use of force, falsehood, or any other act of itself unlawful, and in my opinion it follows that the acts which the indictment alleges the defendants agreed to do, the means they agreed to use, can not be held in law wrongful or wicked. The views here expressed find confirmation in the provisions of our Criminal Code, section 158 [Sect. 158 of chap. 38 of the Revised Statutes of Illinois of 1891], for under well settled rules of construction it is but reasonable to infer that the legislature in adopting section 158 as a section of the act of which section 46 was another section, intended to embody in section 158 all matter in relation to interference by combination and agreement between employee and employer, between capital and industry, which it was thought proper to make the subject of a special criminal law.

Judgment is that the motion to quash the indictment must be sustained.

EMPLOYERS' LIABILITY—CONTRIBUTORY NEGLIGENCE—APPLICATION OF STATUTE.—*Ashland Coal, Iron, and Railway Co. v. Wallace's*

Administrator, 43 Southwestern Reporter, page 207.—This case was originally brought in the circuit court of Boyd county, Ky., against the above-named company to recover damages for the death of one Grant Wallace who, while in the employ thereof as a track layer, was knocked down by slate which fell from the roof of a mine and so injured him that he finally died. A judgment was rendered in favor of the administrator, and the company appealed the case to the court of appeals of the state, which rendered its decision September 25, 1897, and affirmed the judgment of the lower court. (Ashland Coal, Iron and Railway Company *v.* Wallace's Administrator, 42 Southwestern Reporter, page 744.) The company then filed a petition for a rehearing by the court of appeals and the court rendered its decision thereon November 18, 1897, and overruled the petition.

Some points not considered in the original decision were raised and decided upon the rehearing, and are shown in the following, quoted from the opinion of the court:

Appellant asks a rehearing in this case, chiefly because, in the former opinion herein, we failed to consider or construe section 2732 of the Kentucky Statutes, which provides: "Any person employed in any mine governed by this statute, who intentionally or willfully neglects or refuses to securely prop the roof of any working place under his control, or neglects or refuses to obey any order given by any superintendent of the mine in relation to the security of that part of the bank where he is at work, and whoever knowingly and willfully does any act endangering the lives or the health of the persons employed in a mine, or the security of the mines or the machinery, shall be liable to a fine of not less than ten dollars nor more than fifty dollars, to be recovered in the county in which the mine is situate." It is insisted by counsel that, as the entries and roadways of the mine were the working places of Grant Wallace, the same duty and responsibility were imposed by law upon him to see after and prop the roof of the entries as devolves upon a miner, who is actually engaged in taking out coal which is the support of the roof of the mine, to see after the security of the roof of his working place; that the positive duty rested upon Wallace, not only to test the condition of the roof of the entry, that he might report it to the mine boss, but that it was a misdemeanor on his part to begin or continue the work without first making this test to ascertain whether it was secure or not, and, if in his judgment it was not, then to refrain from work until it could be made so by props; and that his failure to do this is contributory negligence on his part, and concludes his right to maintain this suit; and in support of this contention, we are referred to the cases of Coal Co. *v.* Estievenard, 53 Ohio St., 43, 40 N. E., 725; Coal Co. *v.* Muir, 20 Colo., 320, 38 Pac., 378, and Syndicate *v.* Murphy (Ky.), 38 S. W., 700.

In all the cases referred to, the plaintiffs were engaged in actually taking coal out—in actually withdrawing the support from the roof of the mine; and in all of them they necessarily had absolute control and

management of the places in which they were working, and were bound, from the nature of their employment, to look out for the security of the roof. They bear no analogy to the facts of this case. Here the mine had been operated for many years before Wallace had been employed as a track layer, and his duty was simply to lay tracks along the entries. In our opinion, the statute was specially intended to refer to those persons actually engaged as miners in taking out coal, and thereby removing the natural props of the roof, and that it has no application to persons who are specially employed, as was Wallace in this case, to perform duties which had no connection in any way with the weakening or removal of these natural supports.

In the case of Mining Co. *v.* Ingraham, 17 C. C. A., 71, 70 Fed., 223 (a case that is in many respects analogous to this), Judge Caldwell said: "Whatever may be the duty of coal miners with reference to timbering the slopes and roofs of rooms from which they remove coal, the rule is well settled that, after a mine is once opened and timbered, it is the duty of the owner or operator to use reasonable care and diligence to see that the timbers are properly set and kept in proper condition and repair; and for this purpose it is his duty to provide a competent mining boss or foreman, to make timely inspection of the timbers, walls, and roof of the mines, to the end that the miners may not be injured by defects or dangers which a competent mining boss or foreman would have discovered or removed. This is a positive duty which the master owes the servant. Neglect to perform this duty is negligence on the part of the master, and he cannot escape responsibility for such negligence by pleading that he devolved the duty on a fellow-servant of the injured employee. It is an absolute duty which a master owes his servant to exercise reasonable care and diligence to provide the servant a reasonably safe place in which to work, having regard to the kind of work and the conditions under which it must necessarily be performed; and whenever the master, instead of performing this duty in person, delegates it to an officer or servant, then such officer or servant stands in the place of the master, and any servant injured by such negligence may recover from the master for such injury, regardless of the relation the injured servant sustained to the officer or servant whose negligence resulted in inflicting the injury."

The working place of the plaintiff [Wallace] in this case was a roadway which had been opened and used by all the employees of the mine for many years, and he had the right to presume that, when directed to lay the track in the entry, the master had performed his duty, and to proceed with his work relying upon this presumption, unless a reasonably prudent and intelligent man, in the performance of his work as a tracklayer, would have learned facts from which he would have apprehended danger to himself. The petition for rehearing is overruled.

EMPLOYERS' LIABILITY—FIRE ESCAPES—ASSUMPTION OF RISK.—*Huda v. American Glucose Co., 48 Northeastern Reporter, page 897.*—Action was brought in the state of New York by Maryanna Huda, as administratrix, against the company above named, to recover damages

for the death of the intestate, who lost his life by fire in a factory belonging to said company, and of which he was an employee. The evidence showed that in the manufacture of glucose it was necessary to maintain a high temperature, and to that end the windows of the factory opening on the fire escapes were required to be kept closed, as well as all other windows therein. They were therefore kept screwed down, but the sashes were light and easily broken, and at the time of the fire were broken and many employees escaped through them and down the fire escapes. A judgment was given for the defendant company, and upon the plaintiff's appeal to the supreme court, appellate division, fourth department, this judgment was affirmed. She then appealed the case to the court of appeals of the state upon questions certified by the supreme court, which rendered its decision December 14, 1897, and affirmed the action of the lower court.

The opinion of the court was delivered by Judge Gray, and in the course thereof he used the following language:

These facts are sufficient to inform us of the situation, and to enable us to consider the questions certified. They are: "(1) Whether the defendant's method of screwing down the windows of the building in which the deceased was employed, so that there was no access to the fire escapes except by breaking the windows, and forbidding the employees of the defendant engaged in that building from opening the windows, and requiring them to keep a high temperature in the work-rooms, was a violation of the statute requiring a construction and maintenance of fire escapes on such buildings. . . . (3) Whether the deceased, who was familiar with the defendant's methods as stated in the first question, and for a long period had worked under and acquiesced in the conditions stated in the first question, assumed the risks of the situation; and whether, by reason thereof, the plaintiff is not entitled to recover in this action."

The statute referred to in the first question (Laws 1892, chap. 673, sect. 6) provided for the manner of construction of fire escapes upon factory buildings, and that they should have landings or balconies of a certain size, "embracing at least two windows at each story, and connecting with the interior by easily accessible and unobstructed openings." The answer to the first question turns upon the propriety of the resort by the defendant to the methods adopted to keep the temperature of its factory sufficiently high and uniform. That such conditions were necessary is the fact assumed by the question, and it is conclusive here. Obviously, for their maintenance, the windows had to remain closed, and the duty of the defendant to its employees, in the face of that necessity, was not to interpose between them and the means of escape such a barrier in the description of windows constructed as would prevent a ready passage through them. The proof as to these windows is that they were so light in frame as to offer but the slightest difficulty in breaking through, if the time was wanting to unscrew them. The interior of the factory was connected with each balcony upon the fire

escape through windows easily accessible by an unobstructed passage, and the requirement of the statute was thus met. If the windows, as "openings," were readily approached from the interior, and could be passed through, it can not be said that the necessity of having to break them, which the testimony showed was easily done, constituted any greater obstruction than would have been the necessity of uncatching and of lifting them. The reading of the provisions of the statute, upon the subject of fire escapes in factories must be reasonable, and in view of the demands of the case. The construction of the fire escapes must be as prescribed for the outside of the factory building, and, unquestionably, that part of the law which requires a connection to exist with the interior is not to be slighted. But it would be wholly unreasonable to interpret the law as requiring a condition as to the openings upon the fire escapes which the successful prosecution of the business would forbid. There had to be a closed window during the manufacturing process, and, whether it was composed of one sash, or of two sashes fastened together, was immaterial, so long as it was readily removable by breaking through, and a ready access to and through it was preserved. The evidence shows that there was no serious obstruction at all to a passage to and through the windows. The first question certified is answered, therefore, in the negative.

In considering the third question certified, I think, with the assumption of facts to which the formulation of the question compels us, that but the one answer is possible, and that is that the deceased assumed the risks of the situation. An employee is very reasonably regarded as assuming those risks in his employment which are obvious as well as ordinary. If the master has done all that his duty demanded of him with respect to securing the safety of his workmen, as to the place where they have been set to work, and as to the tools and appliances with which that work was to be done, he will not be liable for a personal injury occurring by reason of a risk which is incidental to the business itself, or which results from the dangers of the environment into which the workman knowingly entered, under proper instructions. The judgment appealed from must be affirmed.

Employers' Liability—Guards for Machinery.—*Klatt v. N. C. Foster Lumber Co., 73 Northwestern Reporter, page 563.*—Action was brought in the circuit court of La Crosse county, Wis., by William Klatt against the above-named company to recover damages for injuries received while in its employ. He was working near several chains running parallel with each other along the surface of the floor with his feet close to a sprocket wheel that projected above the floor, and there was no protection to prevent his feet from getting into the wheel and chains. His foot slipped on the floor and was caught by the chain and hooks thereon and severely injured, the toes and a part of the foot being torn off. A judgment was rendered for the plaintiff and the defendant company appealed the case to the supreme court of the state, which rendered its decision December 10, 1897, and affirmed the judgment of the lower court.

Among other points made by the plaintiff, he claimed that the company was responsible in damages for failing to properly guard the machinery as required by a statute of the state, and on this point the supreme court, in its opinion delivered by Judge Marshall, held as follows:

Error is assigned on the refusal of the court to instruct the jury as follows: "You can not find that the defendant was negligent merely because of its failure to provide a partition, guard, contrivance, or appliance between the sprocket wheel and chain, on which plaintiff was injured, and the place where he worked." We are unable to say that error was committed by the ruling referred to. It is not clear from the evidence that ordinary care, under the circumstances, did not require some protection to guard against the danger of employees, circumstanced as plaintiff was, getting their feet caught in the chain and sprocket wheel. So we can not say, as a matter of law, that the omission of such guard was not negligence. The statute of this state [Sect. 1636f, Annotated Statutes of 1889] requires all gearing so located as to be dangerous to employees when engaged in their ordinary duties, to be securely guarded so as to be safe to such employees in such employment. If the sprocket wheel was so located as to be dangerous to plaintiff while engaged in his ordinary duties, unless guarded in some proper way, then the statute applies and the absence of the guard was negligence *per se*. This court has distinctly held that when the law requires some particular thing to be done by a person to guard the personal safety of others, a failure to perform the duty so imposed constitutes actionable negligence at the suit of a person of that class, injured by such failure of duty, without contributory negligence on his part. The fact that a penalty is imposed, by the law requiring the performance of the duty, for noncompliance therewith, makes no difference, unless the penalty be expressly given to the party injured in satisfaction of such injury. In Wharton on Negligence (section 443) the rule is stated thus: "Where a statute requires an act to be done or abstained from, by one person for the benefit of another, then an action lies in the latter's favor, against the former, for neglect of such act or abstinence, even though the statute gives no special remedy. The imposition of a penalty by the statute does not take the place of the remedy by suit for negligence, unless the penalty be given to the party injured in satisfaction for the injury."

Employers' Liability—Railroad Companies—Application of Speed Ordinance to Employees.—*East St. Louis Connecting Ry. Co. v. Eggman, 48 Northeastern Reporter, page 981.*—This was an action on the case brought by E. J. Eggman, as administrator of the estate of Joseph T. Newland, deceased, against the above-named railway company, for negligently causing the death of his intestate. Upon trial in the city court of East St. Louis, Ill., the plaintiff recovered a judgment for $3,500. On appeal to the appellate court of the fourth district the judgment was affirmed, and the railway then appealed to the supreme

court of the state, which rendered its decision December 22, 1897, and affirmed the judgment of the lower courts.

The facts in the case and an interesting point of the decision are given in that part of the opinion of the supreme court which is quoted below:

The declaration charges that, while the deceased was in defendant's employ as a carpenter, constructing a drain near or under defendant's track, on the bank of the Mississippi river, in East St. Louis, the defendant's employees in charge of one of its engines attached to freight cars, negligently and carelessly ran the same upon him, thereby so injuring him that he died. It is charged that he was not a fellow-servant with those in charge of the engine, and that he was in the exercise of due care for his own safety. The negligent acts charged against the servants controlling the engine are that it was being run at a rate of speed exceeding six miles per hour, contrary to an ordinance of the city of East St. Louis, and that, in violation of a like ordinance, it was being run without ringing a bell upon the same; these acts of negligence being within the city limits of the city of East St. Louis, and causing the alleged injury. We shall only notice a few of the points urged here for a reversal.

The first of these, in natural order, is that the declaration states no cause of action, and therefore the trial court erred in overruling the defendant's motion in arrest of judgment. The ground of this position is that the ordinance which the defendant is charged in the declaration with having violated was only intended to protect the public against the danger of moving trains and locomotives at public places, and could have no legal application, as between the railroad company and its employees, to locomotives being run in the company's private grounds. This same question was presented for decision in Railroad Co. *v.* Gilbert, 157 Ill., 354, 41 N. E., 724, and decided adversely to the contention here urged. That case was cited and followed in Railroad Co. *v.* Eggman, 161 Ill., 155, 43 N. E., 620. We have given due consideration to the argument urging the overruling of these decisions, but find no sufficient reason for so doing. The power of the municipality to pass the ordinance as reasonably tending to protect persons against injury is not seriously questioned, and we can see no good reason for holding that a person should be deprived of that protection merely because he is at the time an employee of the company, working in its yards or other private grounds.

Employers' Liability—Railroad Companies—Construction of Statute.—*Keatley v. Illinois Central R. R. Co., 72 Northwestern Reporter, page 545.*—This action was brought in the district court of Dubuque county, Iowa, by the administrator of Robert Keatley, deceased, to recover damages for his death from the railroad company above named. Robert Keatley was a member of a "stone gang" employed by the company in building a retaining wall near one end of an iron bridge which was being built at the same time by an "iron

gang" employed by the company. Trains were allowed to run over this bridge, although not fully completed, and the foreman of the "iron gang" had control over the speed of the trains and signaled them at what speed to go upon and over the bridge. At the time of the accident a freight train came upon the bridge, and the engine and ten cars passed over it. The next two cars were derailed, but passed over the bridge on the ties, and as they came opposite a derrick platform, where the deceased was engaged, one of them rolled off the trestle and, falling on said platform, killed the deceased. The bridge went down with the remainder of the train. It was alleged by the plaintiff that this accident was caused by the negligence of the foreman of the "iron gang" in allowing the train to go upon the bridge at too great a rate of speed. A judgment was rendered for the plaintiff, and the defendant company appealed the case to the supreme court of the state, which rendered its decision October 18, 1897, and affirmed the judgment of the lower court.

From the opinion of the court, which was delivered by Chief Justice Kinne, the following, showing the main points of the decision, is quoted:

This is the second appeal in this case. The opinion in the former hearing will be found in 63 N. W., 560. Much is said in argument by the appellant to the effect that this boy Robert Keatley and his stone gang and the iron gang were fellow-servants, and that, in the absence of the statute (Sect. 1307 of the Code of 1873), there could be no liability under the established facts. It is then insisted that the facts do not bring the case within the provisions of the statute. Appellant's contention is that the negligence of the foreman of the iron gang was not the negligence of one engaged in the operation of the road, within the meaning of the statute, and that decedent was not injured by reason of the negligent operation of the road. On the former appeal this language was used in the opinion: "Applying the facts attending the employment of the deceased to the statute, we think that if he was not out of the line of his duty in standing on the derrick platform, and the employees of the defendant negligently ran the train at a dangerous rate of speed, upon an unfinished and insecure and unsafe bridge, by reason of which the cars left the track, and caused the death of the deceased, he was within the statute, and a right of action accrued." Counsel now insists that plaintiff can not recover unless it appears that the injury complained of was caused by or through the negligence of the employees who were running or operating the train, and, as the trial court instructed the jury that said employees were not negligent, there can be no recovery under the statute. The language of the former opinion is to be construed with reference to what was said before the court and the issues as then made. It was then said that no charge of negligence on the part of employees for failing to put out a flag or other sign to stop the train was made in the petition. The case is now before us on allegations of negligence not made before; and, in view of this

situation, there is nothing in the former opinion justifying the claim counsel now makes for it as applicable to the facts now before us. The statute of 1873 (Code, sect. 1307) is as follows: "Every corporation operating a railway shall be liable for all damages sustained by any person, including employees of such corporation, in consequence of the neglect of agents, or by any mismanagement of the engineers or other employees of the corporation, and in consequence of the willful wrongs whether of commission or omission of such agents, engineers, or other employees, when such wrongs are in any manner connected with the use and operation of any railway, on or about which they shall be employed, and no contract which restricts such liability shall be legal or binding."

On the former appeal we held that the employment of the decedent placed him within the protection of this statute. (Keatley *v.* Railroad Co., supra.) Upon the record now before us, the facts touching his employment are the same as they appeared upon the former trial. We discover no reason for not adhering to our former holding in that respect.

In determining whether the accident resulted from the negligent operation of the train, it is not necessary, as counsel argue, that such negligence must be the act or failure to act of employees who are actually on the train. A train may be controlled by those upon it, or it may be controlled by one not on it, by signals given to those operating the train. It can make no difference, as to the right of recovery, whether the negligence, if any, which resulted in causing the accident, was the act or failure to act of one of the trainmen, or of some other man in the defendant's employ, and who was charged with the duty of controlling the movements of the train by flag signal or otherwise. The foreman of the iron gang had control over the speed of trains across this bridge, and if he failed to signal the engineer of the train, and as a result it moved across the bridge at a dangerous rate of speed, thereby killing the decedent, the negligence was that of one charged with responsibility with respect to the movement of the train. Suppose this foreman of the iron gang had signaled the engineer to go slow across the bridge, and the engineer disobeyed the signal, would any one question the liability of the company if such disobedience resulted in Keatley's death? Surely not. There can be no doubt, then, of liability when another employee (foreman of the iron gang), who is charged with a duty with reference to the moving train, fails to perform it, and as a result a man is killed. (Pierce *v.* Railway Co., 73 Iowa, 140, 34 N. W., 783; Doyle *v.* Railway Co., 77 Iowa, 608, 42 N. W., 555.) Counsel is in error when he says: "In the case at bar there was no negligence in the operation of the railroad by any one engaged in its operation." The foreman of the iron gang, while not an operative upon the train, engaged in the physical labor of controlling its movements, was at the bridge, furnished with a slow flag, charged with the control of the operation of the train over that uncompleted structure, and to that extent it was his duty to control the operation of the train, by giving the proper signal to slow up the train in case the condition of the bridge required it. If he neglected that duty, he neglected a duty touching the operation of the road, because, so far as the duty enjoined upon him to signal the train was concerned, he was as much

engaged in operating the road, within the meaning of the statute, as the engineer on the train.

EMPLOYERS' LIABILITY ACT—CONSTRUCTION OF STATUTE—VICE PRINCIPALS.—*Baltimore and Ohio Southwestern Ry. Co. v. Little, 48 Northeastern Reporter, page 862.*—This action was brought in the circuit court of Pike county, Ind., by Mary F. Little, administratrix, to recover damages for the death of one John F. Little, a locomotive engineer in the employ of the above-named railway company. The death of Little was caused by a collision with a freight train which had been placed upon a siding where it was standing when the collision occurred. The head brakeman of the freight train had unlocked the switch to let his train go upon the siding and had then left the switch open, so that the train of which Little was engineer ran onto the same siding with the freight train instead of passing by on the main track as was intended. It was upon the negligence of this head brakeman that the administratrix based her claim. The decision of the district court was in her favor, and the railway company appealed the case to the supreme court of the state, which rendered its decision December 17, 1897, and reversed the decision of the lower court.

The opinion of the supreme court, which was delivered by Judge Hackney, reads in part as follows:

The limits of our inquiries have been narrowed somewhat by the following concessions of counsel for the appellee [Mary F. Little]: "At the very threshold of our argument, we feel called upon to concede, which we do frankly, that our cause would be untenable, under our Indiana decisions, but for the 'Employers' Liability Act,' of March 4, 1893;" and "we concede again that we must ground our claim for an affirmation of the judgment on subdivisions numbered 3 and 4 of section 1 of that act." This concession, which is undoubtedly correct, would, in the absence of the provisions of the act mentioned, defeat the appellee's recovery upon the rule that the head brakeman, whose negligence caused the collision and the death of Little, was a fellow-servant of Little as to the act negligently omitted. It remains, therefore, to determine whether the paragraph of complaint in question stated a cause of action, freed, by the act mentioned, from the fellow-servant rule.

The third and fourth subdivisions of section 1 of the act of March 4, 1893 (Acts 1893, p. 294; Rev. St. 1894, sect. 7083), are as follows, our figures separating them into specifications of exemption from the fellow-servant rule: (1) "Third. Where such injury resulted from the act or omission of any person done or made in obedience to any rule, regulation or by-law of such corporation [any railroad or other corporation except municipal], or" (2) "in obedience to the particular instructions given by any person delegated with the authority of the corporation in that behalf." (3) "Fourth. Where such injury was caused by the negligence of any person, in the service of such corpora-

tion, who has charge of any signal, telegraph office, switch yard, shop, round-house, locomotive engine or train upon a railway, or" (4) "where such injury was caused by the negligence of any person, co-employee, or fellow-servant engaged in the same common service, in any of the several departments of service of any such corporation, the said person, co-employee, or fellow-servant at the time acting in the place and performing the duty of the corporation in that behalf, and the person so injured, obeying or conforming to the order of some superior, at the time of such injury having authority to direct; but nothing herein contained shall be construed to abridge the liability of the corporation under existing law."

The gist of the cause of action alleged, as we have seen, was in the omission of a duty, which duty was required by rule of the appellant corporation. The complaint did not allege that the omission by the brakeman was in obedience to a rule. It is plain, therefore, that the case does not fall within the first of the above specifications of the act. The appellee's construction of this specification is that if any duty is enjoined by rule, etc., upon a servant, and the duty is omitted or neglected, the corporation is liable for resulting injury. If this was the proper construction of the specification, there would be little requirement for other provisions of the act than those of the third subdivision, since it would strike down the fellow-servant rule in its entirety wherever the act or omission is in the line of duty. It would make the corporation liable for the act or omission of a servant, whether negligent or not, and whether the duty negligently performed or negligently omitted may have been enjoined by the general rules, etc., of the corporation, or is in obedience to particular instructions from one "delegated with authority in that behalf." Such was not the intention of the legislature. On the contrary, we think there can be no doubt that it was intended by the third subdivision to make corporations liable where the servant does an act or omits action in obedience to the command of the corporation given by rule, regulation, or by-law, or through any person delegated with authority from the corporation to make the command. This construction not only arises from the unambiguous language of the subdivision, but is supported by the general character of the act and the provisions of subdivision fourth.

The fourth subdivision relates to the negligence of servants, and not, as with the third subdivision, to acts or omissions done or made by order of the company or some one in command. The specification which we have numbered 3 describes a class of servants for whose negligence corporations are made liable, and they are servants most of whom, if not all, have heretofore been held not to perform a duty which the master owed to other servants in the same general line of the common service, and therefore fellow-servants. In other words, this specification but enlarged the class of vice principals as it had before existed. Does the negligent omission at the foundation of the cause of action here pleaded appear from the pleading to have been by any of the vice principals so described? The only allegation of the complaint is that the omitted duty was by a brakeman, and we find that brakemen are not named in the law among the vice principals therein so

described. But, in order to support the complaint, counsel for the appellee insist that the legislature did not intend to use the phrase "switch yard," but intended to separate the two words with a comma. With this change of punctuation, they would add to the number of vice principals one in "charge of any . . . switch," and then, from the duty to open and close the switch when he admitted his train to the side track, argue that the brakeman was in "charge" of the switch at the time he neglected to close it. This position is supported by the insistence that there is not, in railroading parlance, any such term as "switch yard," and that the lexicographers recognize no such term. In the statute the word "yard" is employed in connection with and as descriptive of railway service, and, as said in Harley *v.* Railroad Co., 57 Fed., 144, "the court may know, from its general knowledge of the methods and appliances of railroad companies, . . . 'the yard' consists of side tracks upon either side of the main track, and adjacent to some principal station or depot grounds, where cars are placed for deposit, and where arriving trains are separated and departing trains made up. It is the place where such switching is done as is essential to the proper placing of cars either for deposit or for departure." "Railroad yard" and "switch yard," we have no doubt are synonymous, and the latter term was used in the act under consideration as descriptive of the former. Accepting our construction of the third specification, there is no place for the contention of appellee's learned counsel that the temporary use of the switch by the brakeman placed him in "charge" of it, within the meaning of the act. Judgment reversed.

Labels of Laborers' Unions—Injunction to Prevent Fraudulent Use of Same, etc.—*Tracy v. Banker, 49 Northeastern Reporter, page 308.*—This was a bill in equity brought in the supreme judicial court of Massachusetts by Thomas F. Tracy, as vice president of the Cigar Makers' International Union of America, a voluntary association, to prevent the defendant from fraudulently using the association's trade-union label, or counterfeits thereof. The decision of the court was rendered February 8, 1898, and a decree for the plaintiff was issued. The decision was based largely upon the construction of chapter 462 of the acts of 1895, and especially of section 3 thereof. The statute provides for the adoption of labels, trade-marks, etc., by individuals, associations, or unions, and section 3 thereof reads as follows:

Sect. 3. The owner of any such label, trade-mark, stamp, or form of advertisement recorded as provided in section 1 of this act, may proceed by suit to enjoin the manufacture, use, or sale of any such counterfeits or imitations, and all courts having jurisdiction thereof shall grant injunctions to restrain such manufacture, use, or sale, and shall award the complainant in such suit such damages resulting from such wrongful manufacture, use, or sale as may by said court be deemed just and reasonable, and shall require the defendant to pay to such person, association, or union the profits derived from such wrongful manufacture, use, or sale; and such court may also order that all such counterfeits

or imitations in the possession or under the control of any defendant in such case be delivered to an officer of the court, or to the complainant to be destroyed. In all cases where such association or union is not incorporated, suits under this act may be commenced and prosecuted by an officer of such association or union, on behalf of and for the use of such association or union, and every member of such association or union shall be liable for costs in any such proceedings.

The opinion of the court was delivered by Judge Holmes and reads, practically in full, as follows:

The defenses requiring notice are that the statute protects only merchants or manufacturers, that the association is not of a kind that will be protected by the court, and laches.

The label is a part of the well-known machinery of trade unions, and the use of it is found, if a finding be necessary, to be of value to the union and its members. It would not be traveling too far from the record, perhaps, if we should assume that the use of the label is in fact, as certainly it might be, of far more economic importance to the union than are many or most of the trade-marks, strictly so called, which are protected by the courts. Nevertheless, technical difficulties, which would have been hard to escape from without some subtlety or a statute, prevented the plaintiff from recovering in a case like this. (See State *v.* Bishop, 128 Mo., 373, 381, 31 S. W., 9.) That was in 1890. Just before the argument of that case there was an attempt at legislation on the subject. (St., 1890, chap. 104.) Three years later a statute was passed which certainly looks as if it had been intended, in part, to meet that decision. (St., 1893, chap. 443.) But this act was still somewhat under the influence of the notion that protection of the label was a protection of manufacture; and after an amendment by St., 1894, chap. 285, it was repealed by the act of 1895, which is still in force. It is true that the present statute is entitled "An act to protect manufacturers from the use of counterfeit labels and stamps." But we can see no sufficient room for doubt that it protects the plaintiff. The first section extends to "any person, association, or union." That unincorporated associations or unions were contemplated is shown by section 3, already referred to, which allows suits to be prosecuted by the officers of such associations or unions. It is impossible to believe that, when the statute mentions unincorporated unions, it does not refer to trade unions. It authorizes such unions to adopt, as well as to record, a label. Therefore it creates a right, if the court is unable to recognize one without its aid. If it applies to trade unions, it must be taken to apply to them as they ordinarily are; that is, as associations of workmen, not as manufacturers or venders of goods. It contemplates that the labels will be applied to merchandise, as of course they must be, and as these labels are. But it carefully abstains from using a word which implies that the protection or wrongful use of labels is confined to manufacturers or venders. The policy of the statute is shown by the above-cited amendment of 1894 to the earlier act, which had for its object to extend the liability to others besides manufacturers.

If, as we think, the statute expressly creates or recognizes the right of trade unions to be protected in the use of labels for trade-union purposes, the suggestion that the association represented by the plaintiff is an unlawful association falls of itself. It is too late to make such a contention as to trade unions generally, even apart from the statute under which this suit is brought. But the general purposes of this union are similar, so far as we know, to the general purposes of other unions. The constitution, as a whole, is not illegal; and the association is not deprived of the protection of the law, for what otherwise would be its rights, if in some incident or particular the purposes which it expresses are unlawful—which we do not imply.

The plaintiff's association had a label registered under the earlier statute of 1893. The defendant has the boldness to urge that because he began his attempt to defraud the union in 1894, before the act of 1895 was passed, after having been permitted on his application to use the label for a time, therefore the plaintiff's union has no rights under the statute. We do not think the suggestion needs more than a statement.

The plaintiff has lost no rights through laches.

Finally, as the plaintiff makes out his right, it is to be protected against one form of swindling as well as another—against the use of real labels in a fraudulent way, as well as against the use of counterfeits—if, indeed, the real labels, as used by the defendant after mutilation, are not counterfeits, within the statute. Decree for plaintiff.

Master and Servant—Wages—Forfeiture.—*Cote v. Bates Manufacturing Co., 39 Atlantic Reporter, page 280.*—This was an action brought by Pierre Cote against the above-named company in the supreme judicial court of Maine to recover $7.14, wages due, and a like amount as a forfeiture under section 4 of chapter 139 of the acts of 1887, which reads as follows:

It shall be lawful for any person, firm, or corporation engaged in any manufacturing or mechanical business, to contract with adult or minor employees to give one week's notice of intention on such employee's part to quit such employment, under a penalty of forfeiture of one week's wages. In such case, the employer shall be required to give a like notice of intention to discharge the employee; and on failure, shall pay to such employee a sum equal to one week's wages. No such forfeiture shall be enforced when the leaving or discharge of the employee is for a reasonable cause. *Provided, however,* The enforcement of the penalty aforesaid shall not prevent either party from recovering damages for a breach of the contract of hire.

The court rendered its decision December 10, 1897, and gave judgment for the plaintiff for the wages claimed but not for the forfeiture. The opinion of the court, delivered by Judge Strout, reads as follows:

Plaintiff was a weaver in defendant's mill, receiving 50 cents per cut. His contract, which was in writing, provided that he should give one week's notice of his intention to quit, and work that week, and that, if he quit without giving such notice and working, he should for-

feit one week's wages. The statute imposes a like forfeiture by a corporation for the discharge of its laborer, without one week's notice of its intention. On Saturday, May 16, 1896, defendant owed plaintiff for two weeks' work, amounting to $14.28. On May 11th defendant gave notice of a reduction in pay of weavers to 48 cents per cut, to take effect on Monday, May 18th. Plaintiff says he first knew of this May 16th. On Monday, May 18th, plaintiff went into the mill, but did not start his loom, and he, with others, refused to work at the reduced rate, and left. He says he was willing to work his notice at the old price, but understood that, if he worked longer, he would only be paid at the reduced rate. He was not told that if he gave notice, and worked the week, he would receive the old price. He went back on the following Wednesday, and worked one week, for which he was paid at the rate of 48 cents per cut, and was also paid $7.14, for one week's work previously done, the company retaining an equal amount as forfeited, on the ground that he left without giving the required notice.

This action is brought to recover the amount withheld, and also a like amount as forfeiture under the statute, for discharging him without notice. The case fails to show legal ground for recovery of forfeiture, as defendant did not attempt to discharge plaintiff.

As to the week's unpaid wages, whatever might have been the legal right of plaintiff to recover at the old rate, if he had given notice on the 18th and worked his week, the plaintiff had good reason to suppose that he would not be so paid, and was therefore justified in leaving. If defendant intended to pay 50 cents per cut, for the time of the week's notice, it could very easily have so informed the plaintiff. But failing in this, and the reply of the superintendent to a remonstrance of the weavers, that the old price would not be restored, fairly gave the weavers to understand that only 48 cents per cut would be paid after May 18th. Acting upon this inference, warranted by all the circumstances, the plaintiff was justified in leaving, and incurred no forfeiture thereby. He is entitled to recover the week's wages withheld. Judgment for the plaintiff for $7.14, and interest from date of writ.

Mechanics' Liens—Application of Statute.—*Koken Iron Works v. Robberson Avenue Railway Co., 44 Southwestern Reporter, page 269.*—This was an action to enforce a mechanic's lien brought up on writ of error from the circuit court of Greene county, Mo., where a judgment had been rendered for the plaintiff, to the supreme court of the state. Said court rendered its decision November 3, 1897, and affirmed the judgment of the lower court.

The decision involved but one point of much interest, which is clearly stated in so much of the opinion of the supreme court, delivered by Chief Justice Barclay, as is quoted below:

Counsel for the railway company insists that street railroads are not within the intent of the law giving a lien upon the "roadbed, station-houses, depot, bridges, rolling stock, real estate and improvements" of "any railroad company" for which work or labor is done, as defined by

the statute (2 Rev. St., 1889, sect. 6741). Undoubtedly, much of the language of that law is applicable to railroads operated by steam. Those were the roads to which the acts were chiefly designed to apply. But the general terms of the law are also susceptible of application to street railroads, and we find nothing in any part of the enactment to indicate that such application is not intended. When we bring into view the various statutes affording liens for materials or labor furnished for the improvement of land, and consider the broad objects sought by such legislation, it seems clear that street railroads were not intended to be exempt from liability to respond to such lien claims in a proper case. Laws of this nature should receive a fair and rational interpretation, and full effect be given to the remedial purpose that constitutes their spirit.

Weekly Payment of Wages—Construction of Statute.—*Commonwealth v. Dunn, 49 Northeastern Reporter, page 110.*—This was an action by the state against John A. Dunn for a violation of the statute in relation to the weekly payment of wages brought in the superior court of Worcester county, Mass. Said case turned largely upon the construction of sections 51, 65, and 78 of chapter 508 of the acts of 1894 and section 1 of chapter 438 of the acts of 1895, which read as follows:

Sect. 51. Every manufacturing, mining or quarrying, mercantile, railroad, street railway, telegraph and telephone corporation, every incorporated express company and water company shall pay weekly each employee engaged in its business the wages earned by such employee to within six days of the date of said payment; and every city shall so pay every employee engaged in its business, unless such employee shall request in writing to be paid in some different manner; and every municipal corporation not a city and every county shall so pay every employee in its business if so required by him; but if at any time of payment any employee shall be absent from his regular place of labor he shall be paid thereafter on demand. The provisions of this section shall not apply to any employee of a co-operative corporation or association who is a stockholder therein, unless such employee shall request such corporation to pay him weekly. The railroad commissioners after a hearing, may exempt any railroad corporation from paying weekly any of its employees who, in the opinion of the commissioners, prefer less frequent payments, and when the interests of the public and such employees will not suffer thereby.

Sect. 65. Any corporation violating the provisions of section fifty-one of this act, requiring the weekly payment of wages, shall be punished by a fine not exceeding fifty dollars and not less than ten dollars.

Sect. 78. Any person violating any provision of this act where no special provision as to the penalty for such violation is made shall be punished by fine not exceeding one hundred dollars.

Sect. 1. Sections fifty-one to fifty-four, inclusive, of chapter five hundred and eight of the acts of the year eighteen hundred and ninety-four, relative to the weekly payment of wages by corporations, shall

apply to any person or partnership engaged in this commonwealth in any manufacturing business and having more than twenty-five employees. And the word "corporation," as used in said sections, shall include such persons and partnerships.

The defendant, Dunn, was convicted and carried the case to the supreme judicial court of the state on exceptions. Said court rendered its decision January 8, 1898, and sustained the exceptions. Chief Justice Field delivered the opinion of the court, and the following is quoted therefrom:

We are of opinion that the effect of St., 1895, chap. 438, is to make persons and partnerships engaged in any manufacturing business in the commonwealth, and having more than 25 employees, subject to the general provisions of St., 1894, chap. 508, sect. 51, concerning manufacturing corporations; but that the special provisions of that section concerning municipal corporations not cities, and concerning counties, co-operative corporations or associations, and railroad corporations are not aplicable to such persons and partnerships. As the word "corporations," found in section 65 of the statute of 1894, can not be held to include the persons and partnerships mentioned in the statute of 1895, we are of opinion that section 78 of the statute of 1894 is applicable to such persons and partnerships. After the passage of the statute of 1895, section 51 of the statute of 1894 is to be read as if the statute of 1895 had been incorporated in it.

DECISIONS UNDER COMMON LAW.

CONSPIRACY—BOYCOTTS.—*Hopkins et al. v. Oxley Stave Co., 83 Federal Reporter, page 912.*—This case was brought before the United States circuit court of appeals, eighth circuit, on appeal from the United States circuit court for the district of Kansas. (See Oxley Stave Co. *v.* Coopers' International Union of North America *et al.*, 72 Federal Reporter, page 695, and Bulletin of the Department of Labor, No. 7, page 783.) A bill for an injunction was asked by the Oxley Stave Company against Lodge No. 18 of the above-named union, the Trades Assembly of Kansas City, Kan., and a number of the individual members of such organizations. As against the organizations the bill was dismissed, and a temporary injunction was granted against the remaining defendants, from which they appealed. The circuit court of appeals rendered its decision November 8, 1897, and, by a divided court, sustained the decision of the circuit court.

The opinion of the court was delivered by Circuit Judge Thayer and contains a full statement of the facts in the case. A strong dissenting opinion was delivered by Circuit Judge Caldwell. Both of these opinions are given below in full:

THAYER, Circuit Judge. This case comes on appeal from an order made by the circuit court of the United States for the district of Kansas, granting an interlocutory injunction. The motion for the injunction was heard on the bill and supporting affidavits, and on certain opposing affidavits. There is no substantial controversy with reference to the material facts disclosed by the bill and accompanying affidavits, which may be summarized as follows: The appellants, H. C. Hopkins and others, who were the defendants below, are members of two voluntary, unincorporated associations, termed, respectively, the Coopers' International Union of North America, Lodge No. 18, of Kansas City, Kan., and the Trades Assembly of Kansas City, Kan. The first of these associations is a labor organization composed of coopers, which has local lodges in all the important trade centers throughout the United States and Canada. The other association, the Trades Assembly of Kansas City, Kan., is a body composed of representatives of many different labor organizations of Kansas City, Kan., and is a branch of a general organization of the same name which exists and operates, by means of local assemblies, in all the principal commercial centers of the United States and Europe. The Oxley Stave Company, the plaintiff below and appellee here, is a Missouri corporation, which is engaged at Kansas City, Kan., where it has a large cooperage plant, in the manufacture of barrels and casks for packing meats, flour, and other commodities. It sells many barrels and casks annually to several large packing associations located at Kansas City, Mo., and Kansas City, Kan., and also has customers for its product in sixteen other states of the Union, and in Europe. Its annual output for the year 1895 was of the value of $164,173. For some time prior to November 16, 1895, the plaintiff company had used successfully in its cooperage plant at Kansas City, Kan., certain machines for hooping barrels, which materially lessened the cost of making the same. It did not confine itself exclusively to the manufacture of machine-hooped barrels, but manufactured, besides, many hand-hooped barrels, and employed a large number of coopers for that purpose. The wages paid to the coopers in its employ were satisfactory, and no controversy had arisen between the plaintiff and its employees on that score. On or about November 16, 1895, the plaintiff company was informed by a committee of persons representing the local lodge of the Coopers' Union, No. 18, at Kansas City, Kan., that it must discontinue the use of hooping machines in its plant. Said committee further informed the plaintiff that they had already notified one of its largest customers, Swift & Co., that, in making contracts with the plaintiff for barrels, the Coopers' Union would require such customer, in future, to specify that all barrels supplied to it by the plaintiff must be hand-hooped. None of the members of this committee were employees of the plaintiff company, and, with one exception, none of the present appellants were or are in its employ. At a later date the Coopers' Union, No. 18, called to its assistance the Trades Assembly of Kansas City, Kan., for the purpose of enforcing its aforesaid demand; and on or about January 14, 1896, a committee of persons representing both of said organizations waited upon the manager of the plaintiff company, and notified him, in substance, that said organizations had

each determined to boycott the product of the plaintiff company unless it discontinued the use of hooping machines in its plant, and that the boycott would be made effective on January 15, 1896. The formal action taken by the Trades Assembly was evidenced by the following resolution:

"To the officers and members of the Trades Assembly, greeting: Whereas, the cooperage firms of J. R. Kelley and the Oxley Cooperage Company have placed in their plants hooping machines operated by child labor; and whereas, said hooping machines is the direct cause of at least one hundred coopers being out of employment, of which a great many are unable to do anything else, on account of age, and at a meeting held by Coopers' Union No. 18 on the 31st of December, 1895, a committee was appointed to notify the above firms that unless they discontinued the use of said machines on and after the 15th of January, 1896, that Coopers' Union No. 18 would cause a boycott to be placed on all packages hooped by said machines the 15th of January, 1896, and at a meeting held by Coopers' Union No. 18 on the 4th of January, 1896, delegates were authorized to bring the matter before the Trades Assembly in proper form, and petition the assembly to indorse our action, and to place the matter in the hands of their grievance committee, to act in conjunction with the committee appointed by Coopers' Union No. 18 to notify the packers before letting their contracts for their cooperage: Therefore, be it resolved, that this Trades Assembly indorse the action of Coopers' Union No. 18, and the matter be left in the hands of the grievance committee for immediate action.

"Yours respectfully,

"J. L. Collins,

"*Secretary Coopers' International Union of North America, Lodge 18.*"

It was also charged, and the charge was not denied, that the members of the voluntary organizations to which the defendants belonged had conspired and agreed to force the plaintiff, against its will, to abandon the use of hooping machines in its plant, and that this object was to be accomplished by dissuading the plaintiff's customers from buying machine-hooped barrels and casks; such customers to be so dissuaded through fear, inspired by concerted action of the two organizations, that the members of all the labor organizations throughout the country would be induced not to purchase any commodity which might be packed in such machine-hooped barrels or casks. The bill charged, by proper averments (and no attempt was made to prove the contrary), that the defendants were persons of small means, and that the plaintiff would suffer a great and irreparable loss, exceeding $100,000, if the defendants were allowed to carry the threatened boycott into effect in the manner and form proposed. The injunction which the court awarded against the defendants was, in substance, one which prohibited them, until the final hearing of the case, from making effective the threatened boycott, and from in any way menacing, hindering, or obstructing the plaintiff company, by interfering with its business or customers, from the full enjoyment of such patronage and business as it might enjoy or possess independent of such interference.

The first proposition contended for by the appellants is that the trial court acted without jurisdiction in awarding an injunction. The ground for this contention consists in the fact that in the bill, as originally filed, two persons were named as defendants who were citizens and residents of the state of Missouri, under whose laws the Oxley Stave Company was incorporated. But as the case was dismissed as to these defendants, and as to the two voluntary unincorporated associations, and as to all the members thereof who were not specifically named as defendants in the bill of complaint, before an injunction was awarded, and as the bill was retained only as against persons concerned in the alleged conspiracy who were citizens and residents of the state of Kansas, the objection to the jurisdiction of the trial court is, in our opinion, without merit. (Oxley Stave Co. *v.* Coopers' International Union of North America, 72 Fed., 695.) It is further urged that the trial court had no right to proceed with the hearing of the case in the absence of any of the persons who were members of the two voluntary organizations, to wit, the Coopers' Union, No. 18, and the Trades Assembly of Kansas City, Kan., because all the members of those organizations were parties to the alleged conspiracy. This contention seems to be based on the assumption that every member of the two organizations had the right to call upon every other member for aid and assistance in carrying out the alleged conspiracy, and that an injunction restraining a part of the members from rendering such aid and assistance would necessarily operate to the prejudice of those members who had not been made parties to the suit. In other words, the argument is that certain indispensable parties to the suit have not been made parties, and that full relief, consistent with equity, can not be administered without their presence upon the record. We do not dispute the existence of the rule which the defendants invoke, but it is apparent, we think, that it has no application to the case in hand. The present suit proceeds upon the theory—without which no relief can be afforded—that the agreement entered into between the members of the two voluntary associations aforesaid is an unlawful conspiracy to oppress and injure the plaintiff company; that no right whatsoever can be predicated upon, or have its origin in, such an agreement; and that the members of the two organizations are jointly and severally liable for whatever injury would be done to the plaintiff company by carrying out the object of the alleged agreement. The rule is as well settled in equity as it is at law that, where the right of action arises *ex delicto*, the tort may be treated as joint or several, at the election of the injured party, and that he may, at his option, sue either one or more of the joint wrongdoers. (Cunningham *v.* Pell, 5 Paige, 607; Wall *v.* Thomas, 41 Fed., 620, and cases there cited.) We perceive no reason, therefore, why the case was not properly proceeded with against the appellants, although numerous other persons were concerned in the alleged combination or conspiracy.

We turn, therefore, to the merits of the controversy. The substantial question is whether the agreement entered into by the members of the two unincorporated associations to boycott the contents of all barrels, casks, and packages made by the Oxley Stave Company which

were hooped by machinery was an agreement against which a court of equity can afford relief, preventive or otherwise. The contention of the appellants is that it was a lawful agreement, such as they had the right to make and carry out, for the purpose of maintaining the rate of wages then paid to journeymen coopers, and that, being lawful, the injury occasioned to the plaintiff company, no matter how great, was an injury against which neither a court of law nor equity can afford any redress. According to our view of the case, the claim made by the defendants below, that one object of the threatened boycott was to prevent the employment of child labor, is in no way material; but, in passing, it will not be out of place to say that this claim seems to have been a mere pretense, since it was shown that the machinery used to hoop barrels can not be managed by children, but must, of necessity, be operated by persons who have the requisite strength to handle barrels and casks weighing from 75 to 80 pounds with great rapidity. It is manifest that this is a species of labor which could not, in any event, be performed by children. Neither do we deem it necessary on the present occasion to define the term "boycott;" for, whatever may be the meaning of that word, no controversy exists in the present case concerning the means that were to be employed by the members of the two labor organizations for the purpose of compelling the plaintiff company to abandon the use of hooping machines. It is conceded that their purpose was to warn all of the plaintiff's immediate customers not to purchase machine-hooped barrels or casks, and to warn wholesale and retail dealers everywhere not to handle provisions or other commodities which were packed in such barrels or casks. This warning was to be made effectual by notifying the members of all associated labor organizations throughout the United States, Canada, and Europe, not to purchase provisions or other commodities, and, as far as possible, to dissuade others from purchasing provisions or other commodities which were packed in machine-hooped barrels or casks. The object of the conspiracy, it will be seen, was to interfere with the complainant's business, and to deprive the complainant company, and numerous other persons, of the right to conduct their busines as they thought proper. To this end, those who were engaged in the conspiracy intended to excite the fears of all persons who were engaged in making barrels, or who handled commodities packed in barrels, that, if they did not obey the orders of the associated labor organizations, they would incur the active hostility of all the members of those associations, suffer a great financial loss, and possibly run the risk of sustaining some personal injury. It may be conceded that, when the defendants entered into the combination in question, they had no present intention of resorting to actual violence for the purpose of enforcing their demands; but it is manifest that by concerted action, force of numbers, and by exciting the fears of the timid, they did intend to compel many persons to surrender their freedom of action, and submit to the dictation of others in the management of their private business affairs. Another object of the conspiracy, which was no less harmful, was to deprive the public at large of the advantages to be derived from the use of an invention which was not only designed to diminish the

cost of making certain necessary articles, but to lessen the labor of human hands.

While the courts have invariably upheld the right of individuals to form labor organizations for the protection of the interests of the laboring classes, and have denied the power to enjoin the members of such associations from withdrawing peaceably from any service, either singly or in a body, even where such withdrawal involves a breach of contract (Arthur *v.* Oaks, 11 C. C. A., 209, 63 Fed., 310), yet they have very generally condemned those combinations usually termed "boycotts," which are formed for the purpose of interfering, otherwise than by lawful competition, with the business affairs of others, and depriving them, by means of threats and intimidation, of the right to conduct the business in which they happen to be engaged according to the dictates of their own judgments. The right of an individual to carry on his business as he sees fit, and to use such implements or processes of manufacture as he desires to use, provided he follows a lawful avocation, and conducts it in a lawful manner, is entitled to as much consideration as his other personal rights; and the law should afford protection against the efforts of powerful combinations to rob him of that right and coerce his will by intimidating his customers and destroying his patronage. A conspiracy to compel a manufacturer to abandon the use of a valuable invention bears no resemblance to a combination among laborers to withdraw from a given employment as a means of obtaining better pay. Persons engaged in any service have the power, with which a court of equity will not interfere by injunction, to abandon that service, either singly or in a body, if the wages paid or the conditions of employment are not satisfactory; but they have no right to dictate to an employer what kind of implements he shall use, or whom he shall employ. Many courts of the highest character and ability have held that a combination such as the one in question is admitted to have been is an unlawful conspiracy, at common law, and that an action will lie to recover the damages which one has sustained as the direct result of such a conspiracy; also, that a suit in equity may be maintained to prevent the persons concerned in such a combination from carrying the same into effect, when the damages would be irreparable, or when such a proceeding is necessary to prevent a multiplicity of suits. The test of the right to sue in equity is whether the combination complained of is so far unlawful that an action at law will lie to recover the damages inflicted, and whether the remedy at law is adequate to redress the wrong. If the remedy at law is for any reason inadequate, resort may be had, as in other cases, to a court of equity. In the case of Spinning Co. *v.* Riley, L. R. 6 Eq., 551, 558, Vice Chancellor Malins held that an injunction was a proper remedy to prevent the officers of a trades union from using placards and advertisements to dissuade laborers from hiring themselves to the spinning company pending a dispute between the latter company and the trades union as to wages, the court said:

"That every man is at liberty to induce others, in the words of the act of parliament, 'by persuasion or otherwise,' to enter into a combi-

nation to keep up the price of wages, or the like; but directly he enters into a combination which has as its object intimidation or violence, or interfering with the perfect freedom of action of another man, it then becomes an offense, not only at common law, but also an offense punishable by the express enactment of the act 6 Geo. IV., chap. 129. It is clear, therefore, that the printing and publishing of these placards and advertisements by the defendants, admittedly for the purpose of intimidating workmen from entering into the service of the plaintiffs, are unlawful acts, punishable by imprisonment, under Id., chap. 129, and a crime at common law."

In Temperton *v.* Russell [1893] 1 Q. B., 715, the facts appear to have been that a committee representing certain trades unions, for the purpose of enforcing obedience to certain rules that had been adopted by the unions, notified the plaintiff not to supply building materials to a certain firm. He having declined to comply with such request, the committee thereupon induced certain third parties not to enter into further contracts with the plaintiff; such third parties being so induced by threats or representations that the unions would cause their laborers to be withdrawn from their employ in case such further contracts were made. It was held that the plaintiff had a right of action against the members of the committee for maliciously conspiring to injure him by preventing persons from having dealings with him. In delivering the judgment of the court the master of the rolls (Lord Esher) quoted with approval a statement of the law which is found in Bowen *v.* Hall, 6 Q. B. Div., 333, to the effect that where it appears that a defendant has, by persuasion, induced a third party to break his contract with the plaintiff, either for the purpose of injuring the plaintiff, or for the purpose of reaping a personal advantage at the expense of the plaintiff, the act is wrongful and malicious, and therefore actionable. In the case of State *v.* Stewart, 59 Vt., 273, 9 Atl., 559, it was held that a combination entered into for the purpose of preventing or deterring a corporation from taking into its service certain persons whom it desired to employ was an unlawful combination or conspiracy at common law. The court said:

"The principle upon which the cases, English and American, proceed, is that every man has the right to employ his talents, industry, and capital as he pleases, free from the dictation of others; and, if two or more persons combine to coerce his choice in this behalf, it is a criminal conspiracy. The labor and skill of the workmen, be it of high or low degree, the plan of the manufacturer, the equipment of the farmer, the investments of commerce, are all, in equal sense, property. If men, by overt acts of violence, destroy either, they are guilty of crime. The anathemas of a secret organization of men appointed for the purpose of controlling the industry of others by a species of intimidations that work upon the mind, rather than the body, are quite as dangerous, and generally altogether more effective, than acts of actual violence. And, while such conspiracies may give to the individual directly affected by them a private right of action for damages, they at the same time lay the basis for an indictment, on the ground that the

state itself is directly concerned in the promotion of all legitimate industries and the development of all its resources, and owes the duty of protection to its citizens engaged in the exercise of their callings."

In Barr *v.* Trades Council (N. J. Ch.), 30 Atl., 881, it appeared that a publisher of a newspaper had determined to use plate matter in making up his paper, whereupon the members of a local typographical union, conceiving their interests to be prejudiced by such action, entered into a combination to compel him to desist from the use of such plate matter. The object of the combination was to be accomplished by the typographical union by a formal call upon all labor organizations with which it was affiliated, and upon all other persons who were in sympathy with it, to boycott the paper, by refusing to buy it or advertise in the same. It was held, in substance, that a person's business is property, which is entitled under the law to protection from unlawful interference, and that the combination in question was illegal, because it contemplated a wrongful interference with the plaintiff's freedom of action in the management of his own affairs. Decisions embodying substantially the same views have been made by many other courts. (Hilton *v.* Eckersley, 6 El. & Bl., 47, 74; Steamship Co. *v.* McKenna, 30 Fed., 48; Casey *v.* Typographical Union, 45 Fed., 135; Thomas *v.* Railway Co., 62 Fed., 803, 818; Arthur *v.* Oakes, 11 C. C. A., 209, 63 Fed., 310, 321, 322. See, also, Carew *v.* Rutherford, 106 Mass., 1; Walker *v.* Cronin, 107 Mass., 555; State *v.* Glidden, 55 Conn., 46, 8 Atl., 890; Vegelahn *v.* Gunter [Mass.], 44 N. E., 1077.) The cases which seem to be chiefly relied upon as supporting the contention that the combination complained of in the case at bar was lawful, and that the action proposed to be taken in pursuance thereof ought not to be enjoined, are the following: Mogul S. S. Co. *v.* McGregor, 23 Q. B. Div., 598; Id. [1892], App. Cas., 25; Continental Ins. Co. *v.* Board of Fire Underwriters of the Pacific, 67 Fed., 310; and Bohn Mfg. Co. *v.* Hollis, 54 Minn., 223, 55 N. W., 1119. In the first of these cases the facts were that the owners of certain steamships, for the purpose of securing all the freight which was shipped at certain ports, and doing a profitable business, had formed an association, and issued a circular to shippers at said ports agreeing to allow them a certain rebate on freight bills, provided they gave their patronage exclusively to ships belonging to members of the association. The association also prohibited its soliciting agents from acting as agents for other competing lines. A suit having been brought against the members of the association, by a competing shipowner, to recover damages which had been sustained in consequence of the formation and action of the association, it was held that the acts complained of were lawful, the same having been done simply for the purpose of enabling the members of the association to hold and extend their trade; in other words, that the acts complained of amounted to no more than lawful competition in trade. Continental Ins. Co. *v.* Board of Fire Underwriters of the Pacific, was a case of the same character as the one last considered, and involved an application of the same doctrine. It was held, in substance, that an association of fire underwriters which had been formed under an agreement that provided, among other things, for the regulation of premium

rates, the prevention of rebates, compensation of agents, and nonintercourse with companies that were not members of the association, was not an illegal conspiracy, and that the accomplishment of its purpose by lawful means would not be enjoined at the suit of a competing insurance company which was not a member of the association. In the case of Bohn Mfg. Co. *v.* Hollis, it appeared that a large number of retail lumber dealers had formed a voluntary association, by which they mutually agreed that they would not deal with any manufacturer or wholesale dealer who should sell lumber directly to consumers, not dealers, at any point where a member of the association was carrying on a wholesale lumber business, and had provided in their by-laws that, whenever any wholesale dealer or manufacturer made any such sale, the secretary of the association should notify all members of the fact. The plaintiff having made such a sale, and the secretary being on the point of sending a notice of the fact to members of the association, as provided by the by-laws, it was held that the sending of such a notice was not actionable, and that an injunction to restrain the sending of such notice ought not to issue. The decision to this effect was based on the ground that the members of the association might lawfully agree with each other to withdraw their patronage, collectively, for the reasons specified in the agreement, because the members, individually, had the right to determine from whom they would make purchases, and to withdraw their patronage at any time, and for any reason which they deemed adequate. We are not able to concede, however, that it is always the case that what one person may do without rendering himself liable to an action many persons may enter into a combination to do. It has been held in several well-considered cases that the law will sometimes take cognizance of acts done by a combination which would not give rise to a cause of action if committed by a single individual, since there is a power in numbers, when acting in concert, to inflict injury, which does not reside in persons acting separately. (Steamship Co. *v.* McGregor [1892], App. Cas., 24, 25; Id., 23 Q. B. Div., 598, 616; Arthur *v.* Oakes, 11 C. C. A., 209, 63 Fed., 310, 321; State *v.* Glidden, 55 Conn., 46, 8 Atl., 890.) But if we concede that the reasoning employed in Manufacturing Co. *v.* Hollis was sound, as applied to the facts in that case, yet it by no means follows (and that fact was recognized in the decision) that the members of the association would have had the power to combine for the purpose of compelling other persons, not members of the association, to withhold their patronage from a wholesale dealer who failed to conduct his business in the mode prescribed by the association.

We think it is entirely clear, upon the authorities, that the conduct of which the defendants below were accused can not be justified on the ground that the acts contemplated were legitimate and lawful means to prevent a possible future decline in wages, and to secure employment for a greater number of coopers. No decrease in the rate of wages had been threatened by the Oxley Stave Company, and, with one exception, the members of the combination were not in the employ of the plaintiff company. The members of the combination undertook to prescribe the manner in which the plaintiff company should manufacture barrels and

casks, and to enforce obedience to its orders by a species of intimidation which is no less harmful than actual violence, and which usually ends in violence. The combination amounted, therefore, to a conspiracy to wrongfully deprive the plaintiff of its right to manage its business according to the dictates of its own judgment. Aside from the foregoing considerations, the fact can not be overlooked that another object of the conspiracy was to deprive the public at large of the benefits to be derived from a labor-saving machine which seems to have been one of great utility. If a combination to that end is pronounced lawful, it follows, of course, that combinations may be organized for the purpose of preventing the use of harvesters, threshers, steam looms, and printing presses, typesetting machines, sewing machines, and a thousand other inventions which have added immeasurably to the productive power of human labor, and the comfort and welfare of mankind. It results from these views that the injunction was properly awarded, and the order appealed from is accordingly affirmed.

CALDWELL, Circuit Judge (dissenting). To prevent the merits of the case from being misconceived or obscured, it is well to state at the threshold what it does, and what it does not, involve. It involves no question of the obstruction of interstate commerce, or the United States mails, or any other Federal right. The bill does not charge that the defendants violated any law of the state of Kansas or of the United States, or that they threaten to do so, or that they are guilty of any breach of the public peace, or that any violence or injury to person, or to public or private property, was perpetrated, threatened, contemplated, or feared. To show precisely what the suit does involve, that portion of the bill which states the plaintiff's grounds of complaint is here copied:

"And your orator alleges and charges that the said defendants have combined, confederated, and conspired together to require of your orator to discontinue in its plant and plants the use of said hooping machines, and, upon refusal of your orator so to do, to boycott the product of your orator's said plant and plants; that is to say, to persuade and coerce all other persons to abstain from having any business relations with your orator, or to patronize your orator by purchasing from your orator the said product and output of your orator's said plants, or from being customers of your orator, or from buying anything from your orator, or sustaining any business relations to your orator, and to so induce, persuade, and coerce all persons to discontinue all dealings with your orator, if your orator shall refuse to comply with the said request and demand of the said defendants, and to exclude your orator from business relations with the public, and to practically break up, suspend, and ruin your orator's business, if your orator shall refuse to accede to the said demand of said conspirators; and the said defendants have so conspired as aforesaid, and to accomplish said conspiracy, by serving notice upon all persons engaged in any business, of a kind in which the product and output of your orator's plant are used, not to patronize your orator, upon pain of withdrawal of patronage from such persons of said conspirators, and of various members of their said organizations,

and of all affiliated and sympathizing kindred organizations, and that said conspirators, and those associated with, related to, and subject to the control of, said conspirators consist of a vast body of people, the number of which is unknown to your orator, in all of the great commercial and trade centers of this and other countries, and possess great power, and are able to, and if unchecked will, do to your orator great damage and injury."

The ground upon which the jurisdiction in equity is rested is that the defendants are, in the language of the opinion of the court, "persons of small means." It will be observed that the bill alleges specifically how the "boycott" was to be conducted, and also how the "conspiracy" was to be accomplished, and that force, threats, or violence is not an element either of the boycott or the alleged conspiracy. Any contention that the defendants meditated violence is silenced by the statement in the brief of the plaintiff's attorney that "it is fair to presume, from the resolution and other testimony, that the defendants were determined to use all means, short of violence, to make the proscription effective." The material part of the answer of the Coopers' International Union appears in the affidavit of its president, and is as follows:

"That about a year and a half prior to the commencement of this action the complainant company commenced to operate certain hooping machines (i. e., machines for cutting hoop locks in, and putting wooply hoops upon, tierces and barrels); that said machines were attended to, and operated by, child labor in said shop (in many instances by children under the age of fourteen years), and that in the operation of said machines the said children were constantly exposed to serious injury, by reason of tender years, inexperience, and the manner of the operation of said machines; that the tierces or barrels hooped by these machines were of an inferior quality, and the said lock, and the manner of locking the hoops thereon, being of such a construction that the said tierces and barrels were unable and unsuitable for the purpose of handling and holding for transportation the products of the packing-houses and various other manufacturers—a fact that was recognized and well known by many of the packing concerns in and about Wyandotte county, Kan. Affiant further says that during the time of his employment by the complainant company there has been returned to said company, as defective and unfit for use, as high as forty-seven out of a shipment of fifty machine-made barrels, and that the percentage of machine-hooped barrels returned to the complainant company as defective was, of an average, ten times as many as returned from the hand-hooped shipments, even though the complainant company employed and retained a large number of unskillful and inefficient men, engaged in hooping barrels and tierces, which said men were not members of said Coopers' Union, and, by reason of their inefficiency, could not become members thereof; that, by reason of the unworkmanlike and defective barrels manufactured and turned out by the said machines, the wages and compensation of the aforesaid journeymen coopers employed in the cooperage establishments of Wyandotte county, Kan., were threatened to be materially lowered and reduced, in this, to wit:

that in the use of said machines in connection with child labor the said complainant company were enabled to, and did, discharge (throw out of employment) a large number of competent and efficient journeymen coopers, citizens of the state of Missouri, and citizens of the state of Kansas, and members of the said Coopers' Union, and that thereafter the said Coopers' Union was informed by some, if not all, of the various cooperage establishments in Wyandotte county, Kan., that unless the complainant company ceased to operate said machines, and to flood the market with cheap and inferior tierces and barrels, they would be obliged to reduce the wages and compensation paid by them to journeymen coopers employed in their various plants, and that one cooperage establishment did reduce the price and compensation of said journeymen coopers, and also threatened the said journeymen coopers belonging to said Coopers' Union with discharge unless the said output and competition of the cheap and inferior product be taken out of the market; . . . that at no time during the said controversy between said Coopers' Union and said Trades Assembly and the said complainant company has there been any violence threatened or contemplated, and that at no time during said period has there been any unlawful interference with the business of the said complainant company, or has any unlawful interference been threatened; that it is the intention of the said Coopers' Union and Trades Assembly, in case the said complainant company insists upon the use of said machines, and the consequent deprivation of the workingmen, members of said Coopers' Union, of their means of livelihood, that they will request (without in any manner threatening violence, or without making any demonstration of force, and without the use of violence, force, or any coercion of any kind) the co-operation of their fellow-workingmen in refusing to purchase or use commodities packed in said defective tierces and barrels manufactured by machinery and child labor; . . . that the action of the said Coopers' Union and said Trades Assembly are simply acts of business competition, opposing the said complainant company, together with all other persons manufacturing wooden, machine-hooped tierces and barrels, and their attempt to use and foist upon the public, machine and child-labor manufactured barrels and tierces; and assisting the said workingmen in securing and protecting their wages and their source of livelihood."

These excerpts from the pleadings accurately present the issues between the parties. In the plaintiff's bill, and the court's opinion, the words, "conspiracy," "threats," and "coerce," are freely used. Indeed, the plaintiff's case is made to rest upon the use of these terms. It is important, therefore, at the threshold, to inquire what is meant by the use of these legal epithets in this case. Unexplained, they have an evil import. A conspiracy is defined to be:

"A combination of persons for an evil purpose; an agreement between two or more persons to do in concert something reprehensible, and injurious or illegal; particularly, a combination to commit treason or exact sedition or insurrection; a plot; concerted treason." (Cent. Dict.)

From the earliest times the word has been used to denote a highly criminal or evil purpose. Thus, in Acts xxiii, 12, 13, it is said:

"And, when it was day, certain of the Jews banded together, and bound themselves under a curse, saying that they would neither eat nor drink till they had killed Paul. And they were more than forty which had made this conspiracy."

Plainly, nothing the defendants did, or are charged with intending to do, comes within this definition of a conspiracy. So as to "threats." In the common acceptation, a threat means the declaration of a purpose to commit a crime or some wrongful act. Now, what the defendants did, and all they did, is explicitly testified to by Mr. Cable, the president of the Coopers' International Union. He says that the Coopers' Union gave complainant notice—

"That unless their use of said machines, and competition of the inferior tierces and barrels with the hand-hooped barrels of the journeymen coopers, members of said association, should cease on or before January 15, 1896, that a boycott would be declared by said Coopers' Union upon the contents of the tierces and barrels hooped by the hooping machines in Wyandotte county, Kan.; meaning thereby that the members of said Coopers' Union, and of its parent association, the Trades Assembly, would thereafter cease to purchase or use any commodities that were packed in machine-hooped tierces and barrels."

Many other witnesses testified to the same effect, and there is no testimony to the contrary. The "conspiracy" charged upon the defendants consisted, then, in the Coopers' Union and the Trades Assembly agreeing not "to purchase or use any commodities that were packed in machine-hooped tierces and barrels, which came in competition with the hand-hooped barrels," which were the product of their labor (and the bill charges no more); and the "threats" consisted in giving the complainant and certain packing houses formal notice of this purpose. The alleged "conspiracy," therefore, was the agreement stated, and the alleged "threats" were the notice given by that agreement, and the "coercion" was the effect that this agreement and notice had on the minds of those affected by them. It is not true that there is nothing in a name. When for "conspiracy" we substitute "agreement," and for "threats" a "notice," the whole fabric of the plaintiff's case falls to the ground. "There are," says Dr. Lieber (Civil Liberty and Government), "psychological processes which indicate suspicious intentions;" and among them is the use of high-sounding and portentous terms, from which much may be implied or imagined, instead of using plain and common words, which accurately describe the action, and leave nothing to implication or imagination. If an act done or threatened to be done is lawful, it can not be made unlawful by giving it a name which imports an illegal act. Names are not things. It is the thing done or threatened to be done that determines the quality of the act, and this quality is not changed by applying to the act an opprobrious name or epithet. Unless the definition of a word fits the act, the definition is false, as applied to that act. "Conspiracy" sounds portentous, but in this instance its sound is more than its meaning. As here used, it describes a perfectly innocent act—as much so as if the charge was that the defendants "conspired" to feed a starving comrade, or to bury a dead one. But if the bill charged, and the proof

showed, that a breach of the peace was imminent, that fact would not confer jurisdiction on a court of chancery. Courts of equity have no jurisdiction to enforce the criminal laws. It is very certain that a Federal court of chancery can not exercise the police powers of the state of Kansas, and take upon itself either to enjoin or to punish the violation of the criminal laws of that state. It is said by those who defend the assumption of this jurisdiction by the Federal courts that it is a swifter and speedier mode of dealing with those who violate or threaten to violate the laws than by the prescribed and customary method of proceeding in courts of law; that it is a "short cut" to the accomplishment of the desired object; that it avoids the delay and uncertainty incident to a jury trial, occasions less expense, and insures a speedier punishment. All this may be conceded to be true. But the logical difficulty with this reasoning is that it confers jurisdiction on the mob equally with the chancellor. Those who justify or excuse mob law do it upon the ground that the administration of criminal justice in the courts is slow and expensive, and the results sometimes unsatisfactory. It can make little difference to the victims of short cut and unconstitutional methods, whether it is the mob or the chancellor that deprives them of their constitutional rights. It is vain to disguise the fact that this desire for a short cut originates in the feeling of hostility to trial by jury—a mode of trial which has never been popular with the aristocracy of wealth, or the corporations and trusts. A distrust of the jury is a distrust of the people, and a distrust of the people means the overthrow of the government our fathers founded. Against the exercise of this jurisdiction the constitution of the United States interposes an insurmountable barrier. In that masterly statement of the grievances of our forefathers against the government of King George, and which they esteemed sufficient to justify armed revolution, are these: "He has combined with others to subject us to a jurisdiction foreign to our constitution and unacknowledged by our laws:" and "For depriving us in many cases of the benefit of trial by jury." Smarting under these grievances, the people of the United States, under the lead of Mr. Jefferson, were extremely careful to place it beyond the power of any department of the government to subject any citizen "to a jurisdiction foreign to our constitution and unacknowledged by our laws," or to deprive any citizen "of the benefit of trial by jury." This was accomplished by inserting in the constitution of the United States these plain and unambiguous provisions:

"The trial of all crimes, except in cases of impeachment, shall be by jury." (Const., art. 3.) "No person shall be held to answer for a capital or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia when in actual service in time of war or public danger." (Const. Amend., art. 5.) "In all criminal prosecutions the accused shall enjoy the right to a speedy and public trial by an impartial jury. . . ." (Id., art. 6.) "In suits at common law where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved." (Id., art. 7.)

These mandatory provisions of the constitution are not obsolete, and are not to be nullified by mustering against them a little horde of equity maxims and obsolete precedents originating in a monarchical government having no written constitution. No reasoning and no precedents can avail to deprive the citizen accused of crime of his right to a jury trial, guaranteed to him by the provisions of the constitution, "except in cases arising in the land and naval forces, or in the militia when in actual service in time of war or of public danger." These exceptions serve to emphasize the right, and to show that it is absolute and unqualified, both in criminal and civil suits, save in the excepted cases. These constitutional guaranties are not to be swept aside by an equitable invention which would turn crime into a contempt, and enable a judge to declare innocent acts crimes, and punish them at his discretion. But notwithstanding the constitution expressly enumerates the only exceptions to the right of trial by jury, and positively limits those exceptions to the cases mentioned, those who favor government by injunction propose to ingraft upon that instrument numerous other exceptions which would deprive the great body of the citizens of the republic of their constitutional right of trial by jury. With the interpolations essential to support government by injunction, the constitution would contain the following further exceptions to the right of trial by jury:

"And except when many persons are associated together for a common purpose, and except in the case of members of trades unions, and other labor organizations, and except in cases of all persons 'of small means.'"

Undoubtedly, it is the right of the people to alter or abolish their existing government, "and," in the language of the Declaration of Independence, "to institute a new government, laying its foundations on such principles, and organizing its powers in such form as to them shall seem most likely to effect their safety and happiness." It is competent for the people of this country to abolish trial by jury, and confer the entire police powers of the state and nation on Federal judges, to be administered through the agency of injunctions and punishment for contempts; but the power to do this resides with the whole people, and it is to be exercised in the mode provided by the constitution. It can not be done by the insidious encroachments of any department of the government. Our ancestors, admonished by the lessons taught by English history, saw plainly that the right of trial by jury was absolutely essential to preserve the rights and liberties of the people, and it was the knowledge of this fact that caused them to insert in the constitution the peremptory and mandatory provisions on the subject which we have quoted. English history is replete with examples showing that the king and his dependent and servile judges would have subverted the rights and liberties of the English people, but for the good sense and patriotism of English juries. It is to the verdicts of the juries, and not to the opinions of the judges, that the English people are chiefly indebted for some of their most precious rights and liberties. A brief reference to one or two of the many cases will serve to illustrate this truth, and show why a trial by jury is the only sure and safe refuge the citizen has for his rights and liberties:

William Penn and William Mead were Quaker preachers. Their religious faith was offensive to the king, and to his judges and the governing class. The Quaker meeting-house having been closed against them, the congregation assembled, in that quiet and orderly manner characteristic of Quakers, in an open place near their meeting-house, where Penn was preaching to them, when they were set upon by the police and violently dispersed. For this Penn and Mead, and not the police who created the disturbance, were indicted. The indictment charged:

"That by agreement between him [Penn] and William Mead before made, and by abetment of the aforesaid William Mead, then and there, in the open street, did take upon himself to preach and speak, and then and there did preach and speak unto the aforesaid William Mead and other persons."

The indictment, like the complaint in this case, bristled with charges of conspiracy, unlawful assembly, etc. Penn, being denied counsel, was compelled to defend himself. When arraigned, he pleaded "Not guilty," and the following, among other, proceedings took place in court during his trial:

"Penn: I affirm I have broken no law, nor am I guilty of the indictment that is laid to my charge; and to the end the bench, the jury, and myself, with these that hear us, may have a more direct understanding of this procedure, I desire you would let me know by what law it is you prosecute me, and upon what law you ground my indictment. Rec.: Upon the common law. Penn: Where is that common law? Rec: You must not think that I am able to run up so many years, and over so many adjudged cases, which we call 'common law,' to answer your curiosity. Penn: This answer, I am sure, is very short of my question; for, if it be common, it should not be so hard to produce. . . ."

Despite much browbeating from the court, Penn continued to demand of the court to be shown the law that made it a crime for him to preach, and for his congregation to assemble to hear him. Finally the court ordered the bailiff to:

"Take him away. Take him away. Turn him into the bail dock." Continuing his defense, Penn said:

"Must I therefore be taken away because I plead for the fundamental laws of England? However, this I leave upon your consciences, who are of the jury, and my sole judges—that if these ancient fundamental laws, which relate to liberty and property, and are not limited to particular persuasions in matters of religion, must not be indispensably maintained and observed, who can say he hath right to the coat upon his back?"

Despite the peremptory charge of the court to find Penn guilty of the alleged "conspiracy" and "unlawful and tumultuous assembly," the jury returned a verdict of "guilty of preaching only." At this the court fell into a passion, browbeat the jury, particularly their foreman, Bushel, and sent them out to return a general verdict of guilty. This the jury refused to do, and, after being sent out three or four times, they returned a general verdict of not guilty, whereupon they were

fined for contempt of court in rendering the verdict contrary to its instructions and to its interpretation of the facts. (6 How. State Tr., 951.) But the jurors asserted their right to render a verdict in accordance with the dictates of their own consciences and judgments, and the court to which they appealed held that they had that right, and could not be punished for exercising it, and reversed the fine. The Penn case, and the proceedings that grew out of it, constitute one of the foundation stones in the English Bill of Rights. With all their astuteness and eager desire to serve the crown, it never occurred to the judges in those days to enjoin the Quakers from meeting, and Penn from preaching to them. This "short cut" would have gotten rid of the jury, and placed Penn and his followers completely in the power of the judges; and, instead of becoming the founder of a great city and commonwealth in a free republic, he would have languished in an English prison for contempt of court, incurred by preaching to his congregation, for he avowed in court "that all the powers upon earth" could not divert or restrain him from that duty.

A bookseller, whose publications contained criticisms on the administration of public affairs, was indicted for publishing a seditious libel. He was tried before the chief justice. "In vain," says an authentic history, "did Lord Ellenborough, uniting the authority of the judge with the arts of the counsel, strive for a conviction. Addressing the jury, he said, 'Under the authority of the libel act, and still more in obedience to his conscience and his God, he pronounced this to be a most infamous and profane libel.' But the jury were proof against his authority and his persuasion. (2 May, Const. Hist. Eng.) They returned a verdict of not guilty, thus vindicating the freedom of the press, and the right to criticise the administration of public affairs.

Seven bishops presented a respectful petition to the king, praying for the enforcement of the laws of the kingdom, and for a redress of grievances. For this they were indicted for libel. It is worth while to note the charge of the judges to the jury. The chief justice said: "And I must, in short, give you my opinion: I do take it to be a libel." And Justice Allibone said to the jury: "Then I lay this down for my next position: That no private man can take upon him to write concerning the government at all; for what has any private man to do with the government, if his interest be not stirred or shaken?" and much more to the same effect. After receiving this charge, the jury, says Lord Campbell, "were marched off in the custody of a bailiff, who was sworn not to let them have meat or drink, fire or candle, until they were agreed upon their verdict. All night were they shut up; Mr. Arnold, the king's brewer, standing out for a conviction until six next morning, when, though dreadfully exhausted, he was thus addressed by a brother juryman: 'Look at me. I am the biggest and strongest of the twelve; but, before I find such a petition as this a libel, why, I will stay until I am no bigger than a tobacco pipe.' The court sat again at ten the next morning, when the verdict of not guilty was pronounced, and a shout of joy was raised, which was soon reverberated from the remotest parts of the kingdom." (2 Camp. Ch. Jus., 111.)

Cases similar to these might be multiplied indefinitely, but enough have been cited to show that it was through the good sense, courage, and love of liberty of the sturdy English juries who stood out against the judges that the right of the people to assemble for lawful purposes, and the right to address them when they were assembled, the right of free speech, and the freedom of the press, and the right of petition for the redress of grievances, were secured to the English people. It is profitable to recur occasionally to these historic cases. They shed light on the action of the framers of our constitution, and explain their resolute and determined purpose to secure to the people of this country the right of trial by jury, against encroachments or invasion from any quarter or upon any pretext, or by any device whatsoever. The framers of the constitution knew that it was not enough that "the rights of man be printed, and that every citizen have a copy." The rights and liberties guaranteed to the people by the constitution would avail them nothing unless they were constantly and carefully guarded from invasion and encroachment from any quarter. They had formed a "government of the people, by the people, for the people," and they committed the protection and defense of the rights of the people under that government to the only agency that could be trusted—to a jury of the people. They put the rights and liberties of the people in the keeping of the people themselves. The king of England, when a petition was presented to him, reciting his encroachments on the rights and liberties of his subjects, and praying for a redress of grievances, returned for answer that "the king's prerogative is to defend the people's liberties." The assurance was not comforting, and brought no relief. Our fathers invested the prerogative of maintaining and defending the people's rights and liberties in the people themselves—in a jury. English judges of great learning and ability had sided with the crown and the aristocratic classes in oppressing the people, and denying them those rights and liberties to which they had an undoubted right by natural law, as well as under their charters of liberty. This denial had been, in a large measure, rendered nugatory by the firm stand for liberty taken by English juries. "History repeats itself." This maxim was not lost on the framers of our constitution. They intended to, and did, interpose an insuperable barrier to the loss of, or the impingement upon, the rights and liberties of the people, by the same agencies that vexed our English ancestors. That insuperable barrier was trial by jury. In this country the right of wage-earners and others to associate together and act collectively is not a boon granted by the government. It is not derived from the constitution, statutes, or judicial decisions. It antedates the constitution. It is a natural and inherent right. It is the natural weapon of weakness. Its only enemies are despots, and those who would oppress the weak in the absence of the protection afforded them by organization and combined action. This right of men to combine together for lawful purposes necessarily carries with it the right of combined action. Of what utility is organization without the right of collective action? Collective action is implied in the very term "organization." Organization has no other object. Man, by

nature, is a social being. Association and collective action, by those having common interests, for their protection and material, moral, and mental improvement, is a natural instinct. The British Parliament, whose power of legislation is unrestrained, and the English courts, in the beginning of the struggle between capital and labor, supposed that they could successfully and permanently suppress this instinct; but, happily for mankind, the natural rights of man and the laws of nature proved more powerful and enduring than the acts of parliament and the judgments of courts. The association of men for combined action was declared to be a conspiracy. The wages of laborers were fixed by acts of parliament, and it was made a crime for a laborer to refuse to work for the statutory wages, or to demand an increase of wages, or to quit the service of his employer. These acts were rigorously enforced by the courts, and their spirit found expression in the judgments of the courts long after their repeal. The courts did more, however, than simply enforce the acts of parliament. They supplemented them by laws decreed by themselves—judge-made laws—among which was the one relied on by the majority of the court to convict the defendants in this case of a conspiracy. This invention of the judges was the most effective rule ever devised by the enemies of liberty to deprive men of the natural right of association and co-operation, and to place them completely at the mercy of despotic power, and those whose interest it was to oppress them. Referring to the case of Bohn Mfg. Co. *v.* Hollis (a case which fully supports the contention of the defendants), the majority of the court say:

"The decision to this effect was placed on the ground that members of the association might lawfully agree with each other to withdraw their patronage, collectively, for the reasons specified in the agreement, because the members, individually, had the right to determine from whom they would make purchases, and withdraw their patronage at any time, and for any reason which they deemed adequate. It is not always the case, however, that what one person may do, without rendering himself liable to an action, many persons may enter into a combination to do. There is a power in numbers, when acting in concert, to inflict injury, which does not reside in a single individual; and for that reason the law will sometimes take cognizance of acts done by a combination, when it will not do so when committed by a single individual."

The proposition here approved by the court, and relied on to weaken the authority of the Bohn Mfg. Co. Case, first emanated from an English court. (Rex *v.* Journeymen Tailors, 8 Mod., 11.) As laid down in that case, the formula reads:

"A conspiracy of any kind is illegal, although the matter about which they conspired might have been lawful for them, or any of them, to do, if they had not conspired to do it."

This proposition, that it is unlawful for men to do collectively what they may do, without wrong, individually, was enunciated more than a century and a half ago, when all manner of association and co-operation among men, offensive to the king, or not in the interest of despotic power or the ruling classes, or not approved by the judges, were declared

by the courts to be criminal conspiracies. It was promulgated at a time "when," in the language of Mr. Justice Harlan in his opinion in Robertson *v.* Baldwin, 165 U. S., 288, 17 Sup. Ct., 333, "no account was taken of a man as man, when human life and human liberty were regarded as of little value, and when the powers of government were employed to gratify the ambition and pleasure of despotic rulers, rather than promote the welfare of the people," and when laborers had no rights their employers or the courts were bound to respect. The idea of the power of men in association has always been abhorrent to despots, and to those who wish to oppress their fellow-men, because its free exercise is fatal to despotism and oppression. The strength it imparts carries its own protection. In all ages those who seek to deprive the people of their rights justify their action by ancient and obsolete precedents, and by coining definitions suited to their ends. In "that codeless myriad of precedent" running back to the Dark Ages called the "Common Law," it is not difficult to find a precedent for inflicting any injustice or oppression on the common people. But these precedents, so shocking to our sense of right, so inimical to our constitution and social and economic conditions, and so subversive of the liberty of men, should be permitted to sleep in profound oblivion. They neither justify nor palliate encroachments on the natural and constitutional rights of the citizens. Under this asserted rule, what a man, when acting singly, may lawfully do, he may not do in concert with his neighbor. What all men may lawfully do, acting singly, it is unlawful for any two or more of them to do, acting in concert or by agreement. What each individual member of a labor organization may lawfully do, acting singly, becomes an unlawful conspiracy when done by them collectively. Singly, they may boycott; collectively, they can not. The individual boycott is lawful, because it can accomplish little or nothing. The collective boycott is unlawful, because it might accomplish something. People can only free themselves from oppression by organized force. No people could gain or maintain their rights or liberties, acting singly, and any class of citizens in the state subject to unjust burdens or oppression can only gain relief by combined action. All great things are done, and all great improvement in social conditions achieved, by the organization and collective action of men. It was the recognition of these truths that prompted the promulgation of the proposition we are discussing. The doctrine compels every man to be a stranger in action to every other man. This is contrary to the constitution and genius of our government. It is a doctrine abhorrent to freemen. It is in hostility to a law of man's nature, which prompts him to associate with his fellows for his protection, defense, and improvement. Under its operation, every religious, political, or social organization in the country may be enjoined from combined action, if their religious faith or political creed or practice is obnoxious to the judge. It was originally designed for this very purpose. In his opinion in the case of Vegelahn *v.* Guntner (Mass.), 44 N. E., 1081, Judge Holmes says:

"So far, I suppose, we are agreed. But there is a notion, which latterly has been insisted on a good deal, that a combination of persons

to do what any one of them lawfully might do by himself will make the otherwise lawful conduct unlawful. It would be rash to say that some as yet unformulated truth may not be hidden under this proposition. But, in the general form in which it has been presented and accepted by many courts, I think it plainly untrue, both on authority and principle. (Com. *v.* Hunt, 4 Metc. [Mass.], 111; Randall *v.* Hazelton, 12 Allen, 412, 414.) There was a combination of the most flagrant and dominant kind in Bowen *v.* Matheson (14 Allen, 502), and in the Steamship Co. Case, and combination was essential to the success achieved. But it is not necessary to cite cases. It is plain, from the slightest consideration of practical affairs, or the most superficial reading of industrial history, that free competition means combination, and that the organization of the world, now going on so fast, means an ever-increasing might and scope of combination. It seems to me futile to set our faces against this tendency. Whether beneficial on the whole, as I think it, or detrimental, it is inevitable, unless the fundamental axioms of society, and even the fundamental conditions of life, are to be changed. One of the eternal conflicts out of which life is made up is that between the effort of every man to get the most he can for his services, and that of society, disguised under the name of 'capital,' to get his services for the least possible return. Combination on the one side is potent and powerful. Combination on the other is the necessary and desirable counterpart, if the battle is to be carried on in a fair and equal way. I am unable to reconcile Temperton *v.* Russell [1893], 1 Q. B., 715, and the cases which follow it, with the Steamship Co. Case. But Temperton *v.* Russell is not a binding authority here, and therefore I do not think it necessary to discuss it. If it be true that workingmen may combine with a view, among other things, to getting as much as they can for their labor, just as capital may combine with a view to getting the greatest possible return, it must be true that, when combined, they have the same liberty that combined capital has, to support their interests by argument, persuasion, and the bestowal or refusal of those advantages which they otherwise lawfully control."

The asserted rule has no boundaries or limitations other than the chancellor's discretion. Whatever combined action he wills to permit is lawful. Whatever combined action he wills to prevent is a conspiracy. In this country the right of associate and combined action hangs on no such slender thread. But it is said that chancellors should exercise great caution and circumspection in the application of this rule. But this still leaves the right of combined action dependent on the discretion of a chancellor. Thus far they have exercised great discretion, and applied it to combined action of labor organizations only. A careful student of social and economical questions of the day, and of the status of the labor movements in England, says:

"A growth in civil rights on the part of the mass of citizens has attended the labor movement in England from the beginning until now. Workmen are no longed compelled or expected to act without counsel and without concert. They hold a yearly congress, whose object it is to consult on current questions, to watch their legislation, and to urge

the measures they desire. The statute book has thus been rewritten in England, with a wide and just regard for the interest of the workman. The fundamental principles of commercial law have taken on new renderings, and accepted new assertions of right. The action of trades unions in demanding better terms, or even a boycott to secure these terms, is no longer a conspiracy in restriction of trade. These methods have won civil acceptance, and gotten to themselves social and moral forces in each instance according to their merit. They seem to be great means of social renovation, which anticipate and prevent revolution. That marvelous political history by which England has won her liberty is repeating itself in her social institutions. Combination is freely accepted. The principle is recognized—a principle fundamental in social renovation—that men may do collectively, without wrong, what they may do without wrong individually." (Bascom on Social Facts and Principles, 237.)

While laborers, by the application to them of the doctrine we are considering, are reduced to individual action, it is not so with the forces arrayed against them. A corporation is an association of individuals for combined action; trusts are corporations combined together for the very purpose of collective action and boycotting; and capital, which is the product of labor, is in itself a powerful collective force. Indeed, according to this supposed rule, every corporation and trust in the country is an unlawful combination; for while its business may be of a kind that its individual members, each acting for himself, might lawfully conduct, the moment they enter into a combination to do that same thing by their combined effort the combination becomes an unlawful conspiracy. But the rule is never so applied. Corporations and trusts, and other combinations of individuals and aggregations of capital, extend themselves right and left through the entire community, boycotting and inflicting "irreparable damage" upon, and crushing out, all small dealers and producers, stifling competition, establishing monopolies, reducing the wages of the laborer, raising the price of the food on every man's table, and of the clothes on his back, and of the house that shelters him, and inflicting on the wage earners the pains and penalties of the lockout and the blacklist, and denying to them the right of association and combined action, by refusing employment to those who are members of labor organizations; and all these things are justified as a legitimate result of the evolution of industries resulting from new social and economic conditions, and of the right of every man to carry on his business as he sees fit, and of lawful competition. On the other hand, when laborers combine to maintain or raise their wages, or otherwise to better their condition, or to protect themselves from oppression, or to attempt to overcome competition with their labor or the products of their labor, in order that they may continue to have employment and live, their action, however open, peaceful, and orderly, is branded as a "conspiracy." What is "competition" when done by capital is "conspiracy" when done by the laborers. No amount of verbal dexterity can conceal or justify this glaring discrimination. If the vast aggregation and collective action of capital is not accompanied by a corresponding organization and collective action of labor, capital will

speedily become proprietor of the wage earners, as well as the recipient of the profits of their labor. This result can only be averted by some sort of organization that will secure the collective action of laborers. This is demanded, not in the interest of wage earners alone, but by the highest considerations of public policy. In the suggestions on the rights of organized labor submitted by Mr. Olney, attorney-general of the United States, as *amicus curiæ* to the court, in the case of Platt *v.* Railroad Co. (November, 1894), 65 Fed., 660, he said:

"Whatever else may remain for future determination, it must now be regarded as substantially settled that the mass of wage earners can no longer be dealt with by capital as so many isolated units. The time is past when the individual workman is called upon to pit his single, feeble strength against the might of organized capital."

And, speaking of the restrictions imposed upon laborers by the courts, he said:

"They can not help knowing that organized capital is not so restricted. And, when treatment so apparently unfair and discriminating is administered through the instrumentality of a court, the resulting discontent and resentment of employees are inevitably intensified, because the law itself seems to have got wrong, and in some unaccountable manner to have taken sides against them."

A conspiracy is defined to be "any combination between two or more persons to accomplish an unlawful purpose, or a lawful purpose by unlawful means." Let the defendants' action be tested by this rule. Their purpose was to drive the plaintiff's barrels out of the market, by giving preference to the barrels produced by their labor, and this purpose was to be accomplished by means of the coopers' and trades' unions everywhere refusing to buy the barrels manufactured by the plaintiff, or any of the commodities packed in them by any one. Divested of the legal epithets and verbiage, this is precisely what the defendants propose to do, and all they propose to do. And it is this the court has enjoined them from doing. They are enjoined from refusing to buy the barrels, and the commodities packed in the same. If the defendants are not allowed to determine for themselves what they will not buy, they ought not to be allowed to determine what they will buy; and the court's guardianship should go a step further, and tell them what to buy. If the court can enjoin the defendants from withdrawing their patronage and support from the plaintiff, and persuading others to do the same, it is not perceived why it can not, by a mandatory injunction, make it obligatory upon the defendants to purchase the plaintiff's barrels and their contents, and persuade others to do the same. The invasion of the natural rights and personal liberty of the defendants would be no greater in the one case than in the other. The plaintiff has an undoubted right to hoop its barrels in any mode it sees fit, and the defendants have an undoubted right to refuse to purchase them, or the commodities packed in them, no matter how they are hooped. These are the business rights of the parties, and the exercise of its business right by one party is not an interference with the business right of the other. The defendant's declared purpose not to purchase commodities packed in barrels made by the plaintiff is not an illegal

interference with its business, because it is not a business right of the plaintiff to require the defendants to purchase such commodities or to refrain from proclaiming their resolution not to purchase them. In a word, it is none of the plaintiff's business out of whose make of barrels the defendants purchase their meats and other supplies. It is said in the opinion of the court that those persons who did not discontinue the use of the complainant's barrels and the commodities packed in them would "possibly run the risk of sustaining some personal injury." The suggestion is not warranted by any averment in the bill, nor is there a scintilla of evidence in the record to justify it. It does the defendants great injustice. No men could go about a business in a more peaceable, orderly, and law-abiding manner than did these defendants. A rigid purpose of order and keeping the peace presided over all their plans. Their sole purpose was a resolute business nonintercourse. It is, of course, possible for every man to inflict some personal injury on another. That can be predicated of all men, and, if this possibility is a ground for injunction, then every man, including the members of this court, should be enjoined from injuring every other man. If this is a sufficient ground for an injunction, a Federal judge can, at his pleasure, slip an injunction noose over every neck in the republic. But an injunction is not granted "except with reference to what there is reason to expect in its absence." To enjoin law-abiding men from breaking the law, because it is in their power to break it, is to confound all distinction between the law-abiding man and the lawbreaker. The court say, "No decrease in the rate of wages had been threatened by the Oxley Stave Company." But such reduction of wages was threatened by all the other cooperage establishments. Mr. Cable testifies that the members of the Coopers' Union were notified by "the various cooperage establishments in Wyandotte county, Kan., that unless the complainant company ceased to operate said machines, and to flood the market with the cheap and inferior tierces and barrels, they would be obliged to reduce the wages and compensation paid by them to journeymen coopers employed in their various plants, and that one cooperage establishment did reduce the price and compensation of said journeymen coopers, and also threatened the said journeymen coopers belonging to said Coopers' Union with discharge unless the said output and competition of the cheap and inferior product be taken out of the market." Mr. Butler testifies "that the effect of the said action of the complainant company has already caused threats to be made of a large reduction of the wages of journeymen coopers employed in the cooperage plants in Wyandotte county, Kan.;" that other cooperage firms have notified their employees "that if the complainant company continued to operate said machines, and continued to place upon the market a cheap and inferior product in competition with the hand-made products of other plants, the said employees must expect a reduction in their wages, or a discharge from their employment." Moreover, independently of this direct testimony, it is obvious that, if the plaintiff's barrels drove out of the market the hand-hooped barrels, all coopers engaged in that branch of the work would lose their employment, and that the plaintiff would eagerly avail itself of any reduction in the wages of coopers by

other cooperage establishments. The court further remarks, " . . . With one exception, the members of the combination were not in the employ of the plaintiff company." The very object of labor organizations is to impart to every laborer the strength of all. A great nation will go to war to maintain the rights of its humblest citizen. A nation that would not do this would justly lose the respect of every other nation, and soon no respect would be paid to the rights of its citizens. The cause of one laborer is the cause of all laborers. Organized labor must give to each of its members its collective force and influence, else they will fall, one by one, a sacrifice to the greed of their employers. If labor organizations did not have the right to protect and defend the interests of their members, individually as well as collectively, they would be of no utility, and would soon come under abject submission to capital, which grants nothing of fundamental value to wage earners which it is not coerced to grant by the combined power of the labor organizations, or legislation brought about usually through their influence.

It will appear from a critical examination of the cases cited in support of the court's conclusion that the facts in each one of them entitled to respectful consideration as a precedent are widely different from the facts in this case. In every one of them having any close analogy to the case at bar, there was the element of violence, or threats of violence, or actual trespass upon the person or property, or the threat of it, or some display of physical force, or action which was held to constitute a trespass or implied threat. No one of these elements is found in this case. It is simply and purely a case where the labor organizations resolved that they would not purchase or use the barrels manufactured by the complainant, or any commodities packed therein. This they had an absolute right to do, without regard to the question how the complainant's barrels were manufactured, or whether they were inferior to, or better than, the hand-hooped barrels produced by the labor of the defendants. The grounds of the boycott are wholly immaterial, in determining the right to boycott. Whether organized labor has just grounds to declare a strike or boycott, is not a judicial question. These are labor's only weapons, and they are lawful and legitimate weapons; and so long as in their use there is no force or threats of violence, or trespass upon person or property, their use can not be restrained. Laborers are not wards of chancery. A court of chancery has no more authority to interfere with labor organizations, in the conduct of their business, than it has to interfere with the business of corporations and trusts, and other combinations of capital, in the conduct of their business; and in the case of a strike or boycott, as long as each side is orderly and peaceful, they must be permitted to terminate their struggle in their own way, without extending to one party the adventitious aid of an injunction.

Something is said about its being against public policy to boycott articles made by machinery. As before said, it is immaterial whether an article is produced by hand labor or machinery. Products produced by machinery are no more exempt from competition and a boycott than the products of hand labor. The products of machines stand on no

higher plane, in law or equity, than the like products produced by the labor of man. They may be put in competition with each other, and that competition may be prosecuted precisely as was done in this case.

There are numerous authorities supporting the views of the minority—many of them going far beyond the requirements of this case: Reynolds *v.* Everett, 144 N. Y., 189, 39 N. E., 72; Sinsheimer *v.* Garment Workers, 77 Hun, 215, 28 N. Y. Supp., 321; Com. *v.* Hunt, 4 Metc. (Mass.), 111; Randall *v.* Hazelton, 12 Allen, 412, 414; Publishing Co. *v.* Howell (Or.) 38 Pac., 547; Bowen *v.* Matheson, 14 Allen, 502; Continental Ins. Co. *v.* Board of Fire Underwriters of the Pacific, 67 Fed., 310; Mogul S. S. Co. *v.* McGregor, 21 Q. B. Div., 544, s. c. 23 Q. B. Div., 598; Bohn Mfg. Co. *v.* Hollis, 54 Minn., 223, 55 N. W., 1119; McHenry *v.* Jewett, 90 N. Y., 58; Gilbert *v.* Mickle, 4 Sandf. Ch., 357. The force of the Steamship Mogul Case, and others of the cases cited, is attempted to be broken by the statement that these were cases of "lawful competition in trade," and therefore not applicable to the defendants, who, it is impliedly said, are not entitled to enjoy the right of competition. This is a misconception of what it takes to constitute competition, and of the relation one must sustain to the business to be entitled to the rights of a competitor. The error probably springs from the erroneous assumption that a boycott can not be used as a weapon of competition, or consist with it. Competition is defined to be an "endeavor to gain what another is endeavoring to gain at the same time." (Cent. Dict.) In such a struggle the boycott is perfectly legitimate. It is resorted to by great corporations and trusts—the sugar trust, the meat trust, the oil trust, and scores of others. That one competing for the mastery in any line of business may rightfully resort to the boycott was decided in the Steamship Mogul Case. (Mogul S. S. Co. *v.* McGregor, 15 Q. B. Div., 476.) When that case was before Lord Chief Justice Coleridge, he said:

"It was an application of the plaintiffs for an injunction to restrain the defendants from doing that which was called throughout the case—and which I really see no reason for hesitating to call, also—'boycotting the plaintiffs.'"

And he refused the injunction, and on appeal his judgment was affirmed.

It is the right of every man to compete with every other man in all lawful business pursuits. Every wage earner has this right. His own interests, no less than the interests of his employer, are at stake. If his employer can not successfully compete with his rivals, he must either go out of business, or reduce the wages of his employees, as was threatened to be done in this case. The wage earner may therefore not only give preference to his employer's commodities, and to the product of his own labor, but he may carry competition to the bitter end, including the boycott, in order to gain the supremacy in the market for his employer's wares, upon whose successful sale his wages, and in some cases, probably, his existence depend. Competition is not confined alone to cases where the competitors represent large moneyed capital, and are the exclusive owners of the commodity or business out of which the competition arises. It is a fundamental error to deny to

labor the rights and privileges of competition, upon the ground that labor is not capital, and therefore not entitled to any of the rights of capital. It is capital of the very highest and most valuable type. It is the creator of all other capital. Cardinal Manning (a great authority upon any subject upon which he wrote, and who was a profound student of the social and economic problems of the time, with a view of adjusting the relations of the church to existing social conditions), speaking of the laborer and his rights, says:

"Among the English-speaking peoples of the world (that is, in the new world, which seems to be molding our future), a workingman is a free man, both in his person and in the labor of his hand. The mere muscular labor of his arm is his own, to sell as he wills, to whomsoever he wills, wherever and for whatsoever time he wills, and at whatsoever price he can. If his labor be skilled labor, or even half-skilled labor, it is all the more valuable, and absolutely his own possession. In truth, it is the most precious form of capital, which gold and silver may purchase, but on which gold and silver absolutely depend. Money is but dead capital, after all, but the live capital of human intelligence and the human hand is the primeval and vital capital of the world. Unless these rights of labor can be denied, liberty of organization to protect these rights and the freedom founded on them can not be denied." (Letter to Catholic Tablet, April 28, 1887.)

In his first annual message to congress, Mr. Lincoln expresses the same idea in different language. He said:

"Labor is prior to, and independent of, capital. Capital is only the fruit of labor. Capital could never have existed if labor had not first existed. Labor is the superior of capital, and deserves much the more consideration."

That the struggle between the plaintiff and defendants is purely competitive is a fact proven in the case. Mr. Day, president and general manager of the Western Cooperage Company, (an intelligent and disinterested witness), testifies that:

"The present controversy is simply a competition between the proprietors of wood-hooping machines and the journeymen coopers; the former endeavoring to displace the latter by machine, unskilled labor, and the latter endeavoring to protect and maintain their wages and occupation."

It can not be the law that the men and women who do the work of the world, and who produce its wealth, have no rights against the wealth they create, and no right to prefer and promote by lawful and peaceful means the sale of the products of their labor, to secure for themselves continued employment. The "irreparable damage" suffered in business by a vanquished competitor at the hands of his successful rival constitutes no cause of action, either at law or in equity. It is the result of the law of competition, to which all men are subject. They take their chances, and must abide the result, whether it bring fortune or failure. In the Steamship Mogul Case, Lord Chief Justice Coleridge said that it was the resolute purpose of the defendants—

"To exclude the plaintiffs, if they could, and to do so without any consideration of the results to the plaintiffs if they were successfully

excluded. This, I think, is made out, and I think no more is made out than this. Is this enough? It must be remembered that all trade is, and must be, in a sense, selfish. Trade not being infinite—nay, the trade of a particular place or district being, possibly, very limited—what one man gains another loses. In the hand to hand war of commerce, as in the conflicts of public life, whether at the bar, in parliament, in medicine, in engineering (I give examples only), men fight on without much thought of others, except a desire to excel or defeat them."

And the learned judge held that the plaintiffs could have no redress for their losses; they were losses incident to competition in business, and, as we have seen, to a competition carried on by what the learned chief justice said was "boycotting the plaintiffs." If every one likely to be "irreparably damaged" by competition could enjoin his competitors from boycotting his wares (that is, refusing to buy or deal in them), there would soon be an end of all competition. Under the existing social and economic conditions, the natural person, it has been well said, is the merest rudiment of a man. He can only make his power felt, promote his interests, and defend his rights by association and combination with others. Business and commercial pursuits of any magnitude are not carried on by natural persons any more. All capital seeks to increase its power by combination, and to that end assumes the form of corporations and trusts. The plaintiff in this case is a corporation. It represents a number of persons associated together for the very purpose of combined and collective action. Many of these combinations are on a gigantic scale. Their power and influence are wellnigh irresistible. They are the employers of the great mass of the laborers. They are formed solely for pecuniary profit, and know no other law than that which promotes their pecuniary interests. They defy all social restraints that would have a tendency to lessen their dividends. What the stockholders want is more dividends, and the best manager is the man who will make them the largest. The struggle is constant between the laborers, whose labor produces the dividends, and those who enjoy them. The manager is tempted to reduce wages to increase dividends, and the laborers resist the reduction, and demand living wages. Sometimes the struggle reaches the point of open rupture. When it does, the only weapons of defense the laborers can appeal to are the strike or the boycott, or both. These weapons they have an undoubted right to use, so long as they use them in a peaceable and orderly manner. This is the only lawful limitation upon their use. That limitation is fundamental, and must be observed. It was observed in the case at the bar to its fullest extent. If these weapons are withheld from them, then, indeed, are they left naked to their enemies. One class of men can not rely for protection and the maintenance of their rights upon the justice and benevolence of another class, who would reap profit from their oppression. They must be in a position to compel respect, and make it to the interest of their adversary to grant their reasonable and just demands. Laborers can only do this by making common cause—by organization and collective action. The right of organization itself may as well be denied to them, if the right of peaceful and

orderly collective action is denied them. It is vital to the public interests, as well as to laborers, that this should not be done. A labor organization in itself teaches respect for law and order. The conscious obedience to the rules and regulations of the organizations inculcates a spirit of obedience to all law. Orderly collective action can be attained through organization only. In its absence we have the ungoverned and ungovernable mob. A labor organization improves the mental, moral, material, and physical condition of its members. It teaches them how best to perform their duties, and to become expert in their several callings. The great improvement made in the last half century in the condition of the wage earners is due almost exclusively to the power of these organizations. Sir John Lubbock, whose learning and impartiality must be conceded, in a recent volume (Treasures of Life) ventures to predict that "the readers of the next generation will be not our lawyers, doctors, shopkeepers, and manufacturers, but the laborers and mechanics;" and, if this prediction is verified, it will be mainly due to the beneficent influence of these organizations. To strike them down at a time when their adversaries are more powerful than they ever were in the history of the world is to take a long step backward into the Dark Ages. It is, indeed, the revival of despotism for laborers, and means their practical enslavement to great aggregations of capital, whose greed takes no note of human destitution and suffering. Their adversaries combine to act collectively, and it is not a conspiracy. It is the business of the law to see that no man or class of men, under any pretext whatever, is granted rights or privileges denied to other men or classes of men. The public order must be secured, and private rights protected, under the constitution and laws, without denying to labor, or any other class of citizens, their natural and constitutional rights. Let the person and property of every citizen be securely protected by fixed laws, and speedy punishment follow the commission of crime. Let the constitutional mode of trial remain inviolate. The necessity for this is illustrated in this case. No American jury could be found who would say these defendants were guilty of a "conspiracy," or of making "threats" to injure any one. Like the jury in the Penn Case, they would say, "Guilty of refusing to purchase the plaintiff's barrels and the commodities packed in them, only," and the common sense of all mankind would respond that that creates neither criminal nor civil liability on any one. The decree of the circuit court should be reversed, and the case remanded, with instructions to dismiss the bill.

Employers' Liability—Assumption of Risk.—*Collins v. Laconia Car Co., 38 Atlantic Reporter, page 1047.*—This suit was brought before the supreme court of New Hampshire on exceptions from Belknap county from a judgment rendered below for the plaintiff, Collins, in a suit brought by him against the above-named car company for damages for injuries sustained while in its employ. He was engaged about a "press machine" upon which were uncovered cogwheels upon the right side of the machine where the plaintiff was working. The plaintiff reached to a shelf back of the machine for his apron, and in withdraw-

ing his arm his hand was caught in the gearing of the cogwheels and was injured. At the time of the accident plaintiff had worked on the machine nearly a year. He was about fifty-two years of age, and of average intelligence. No warning as to the danger from the gearing, or instructions as to the precautions which should be taken to avoid it, was given to him by the defendants; and there was also evidence tending to show that the gearing should have been covered to make it reasonably safe. The plaintiff testified that he knew he would get hurt if he got his hand in the gearing, but that he never thought of the danger, and that, when he took his apron from the shelf, he was not thinking of it, and that, if he had, he supposed he should not have got hurt.

The supreme court rendered its decision March 15, 1895, and reversed the judgment of the court below. From the opinion of said court, delivered by Judge Blodgett, the following is quoted:

The motion for a nonsuit should have been granted. Familiar principles of universal acceptation forbid any other conclusion. The plaintiff's grounds of complaint are solely(1) that the gearing was not reasonably and safely protected, and (2) that the defendants gave him no warning or instruction as to the resulting danger. No recovery can be had upon either of these grounds.

The fact that the gearing was not covered is not of controlling importance. The danger from it was as apparent to the plaintiff as to the defendants; and there was no emergency requiring him to expose himself to the danger. It was obviously one of the "seen dangers" of which the servant assumes the risk by entering upon the employment, even though reasonable precautions have been neglected by the employer. As to all defects and dangers which are open to the observation and within the knowledge and comprehension of master and servant alike, both stand upon common ground; and no recovery can be had for a resulting injury to the latter when he is of sufficient intelligence and knowledge to comprehend the risks incident to the service, which is presumed in the case of an adult person, in the absence of evidence showing the contrary. In such a case an injury to the servant is within the scope of the danger which both the contracting parties contemplated as incidental to the service, and the master can not be held liable for the injury. Much less can he be held liable when, as in the present case, it affirmatively appears, not only that the danger of which the servant complains was open to common observation and within common comprehension, and that he was of sufficient intelligence and knowledge to comprehend it, but that he actually did know and comprehend it. In brief, the plaintiff stands no better than he would have stood if, by special agreement with the defendants, he had assumed the risk of the gearing.

Of still less importance is the fact that no warning or instruction as to the danger from the gearing was given to the plaintiff by the defendants. None was necessary. It would have been a useless formality merely. The most that could have been said to him was that he must

keep away from the gearing when the machine was in operation, or he would get hurt. But this would have given him no knowledge he did not already possess. The danger of getting caught in the gearing was perfectly obvious to him, and he therefore knowingly and voluntarily assumed it as one of the ordinary risks of his employment. The duty resting on the master to instruct or warn the servant of all latent and hidden defects or hazards incident to the employment, of which the master knows or ought to know, does not extend to dangers open to ordinary observation, except in cases of youth, inexperience, ignorance, or want of capacity of the servant, and can not be invoked as to patent defects or dangers by a servant of mature capacity and knowledge. As to such defects or dangers as are obvious to the senses, he is bound to take notice; and when, as in the case of this plaintiff, he admits he knew of the danger and comprehended it, it would be as absurd as it manifestly would be unjust to permit a recovery on the ground that his employers did not warn him of that danger. Judgment for the defendants.

EMPLOYERS' LIABILITY—DUTIES OF THE MASTER—NEGLIGENCE.—*Belleville Stone Co. of New Jersey v. Mooney, 38 Atlantic Reporter, page 835.*—Suit was brought in the circuit court of Essex county, N. J., by Henry Mooney against the above-named company to recover damages for personal injuries received by him while in the employ of said company. He was injured by being struck by a stone from a blast in a quarry belonging to said company. Judgment was given for Mooney, and the company appealed the case to the supreme court of the state, which rendered its decision November 12, 1897, and affirmed the judgment of the lower court.

The opinion of the supreme court was delivered by Judge Lippencott, and the syllabus of the same, which was prepared by the court, lays down certain principles of the common law as follows:

5. It is the duty of the master to exercise reasonable care to provide a safe place for his servant to work in, for his protection from all but the assumed and accepted dangers, and this duty remains the same where the dangers arise to the servant by reason of the adoption or use of a system by which the business of the master is performed or conducted.

6. If this general duty is intrusted by the master to his agent, superintendent, or co-servant of the servant injured, the negligence of such agent or superintendent in the performance of this duty is imputable to the master.

8. Where the master, or one representing the master, as general superintendent of the work, promises a servant engaged in such work to remedy and obviate a certain danger to which the servant has called his attention, this promise does not relieve the servant from the further assumption of the risks of danger if the risks or dangers be obvious or incidental to his employment, or risks the danger of which he in the exercise of ordinary care could discover or know, and the master will

not be liable for an injury resulting from such risks; but if the employment of the servant be in such a place or under such circumstances that he can not know of the danger, or it is not obvious to him, he can continue in the employment under the assumption that the promise will be performed for his protection, and the master will be liable for injury to him resulting from the danger arising from the default of the master in the nonperformance of the promise.

9. Where an injury arises to a workman by reason of the united negligence of a master and a fellow-servant, the master is liable to respond for such injuries.

LABELS OF LABORERS' UNIONS—APPLICATION FOR INJUNCTION TO PREVENT UNAUTHORIZED USE OF SAME.—*Hetterman et al. v. Powers et al., 43 Southwestern Reporter, page 180.*—Action was brought in the circuit court of Jefferson county, Ky., by Powers and others against Hetterman Brothers and others to restrain them from using a certain cigar label. Judgment was rendered for the plaintiffs, and the defendants appealed the case to the court of appeals of the state, which rendered its decision October 27, 1897, and sustained the judgment of the lower court.

The opinion of said court was delivered by Judge Hazelrigg, and in the course of the same he used the following language:

The appellants were manufacturers and dealers in cigars in Louisville, Ky., and, without right or claim of right, used on boxes of cigars manufactured and sold by them the blue label of the Cigar Makers' International Union of America, a *facsimile* of which is as follows: "Sept., 1880. Issued by Authority of Cigar Makers' International Union of America. Union-Made Cigars. This certifies that the cigars contained in this box have been made by a first-class workman, a member of the Cigar Makers' International Union of America, an organization opposed to inferior, rat-shop, cooly, prison, or filthy tenement-house workmanship. Therefore we recommend these cigars to all smokers throughout the world. All infringements upon this label will be punished according to law. A. Strasser, President, C. M. I. U. of America."

Thereupon appellees Powers, Keiffer, and Wopprice, suing for themselves and all their associate and fellow-members in the Cigar Makers' International Union and the Cigar Makers' Protective Union, No. 32, and joining these two organizations, also, as plaintiffs, brought this action to prevent this alleged wrongful use of the label. The International Union, embracing, according to the petition, some —— members, and the local union, some —— members, are voluntary, unincorporated labor organizations, composed solely of practical cigar makers. They are workingmen who do not own the products of their labor, being exclusively wage workers. The purpose of these unions, as said in the petition, is, generally, to maintain a high standard of workmanship, and secure fair wages to cigar makers; to elevate the material, moral, and intellectual welfare of the membership: and, by legitimate, organized effort, to secure laws prohibiting labor by children under fourteen

years of age, the abolition of the "truck" system, the tenement-house cigar manufacture, and the manufacture of cigars by prison convict labor. Other praiseworthy objects are set out, which need not be detailed. It is further averred that, for the purpose of designating the cigars made by members of the unions, the label in controversy was adopted and extensively used as a trade-mark, or certificate of identification, and, when posted on the outside of cigar boxes containing cigars made by members of the unions, it is a guaranty that the cigars are made by first-class workmen, members of the cigar makers' union, etc.; that because the members receive fair wages, and were thus able to furnish good workmanship, the cigars so labeled commanded a higher price than did similar looking cigars not so labeled; that the label was therefore a source of great profit and benefit to the appellees, and other members of the unions. The appellants, for defense, do not deny the use of the label as charged in the petition, but it is insisted by them that this label does not possess any of the elements of a trade-mark; that the appellees are engaged in no trade, having nothing to sell, and therefore nothing to protect by a trade-mark; that none of them are engaged in the business of selling cigars; that they are "simply workmen employed by other people making cigars—first by one person, and then another—and those persons sell the cigars;" that the plaintiffs, therefore, "have not shown any property right in the label, as a trade-mark, or otherwise;" moreover, that the membership is an ever-changing one, constantly varying in members, composed of a few thousands to-day, and many thousands to-morrow—"a shifting crowd;" that the plaintiffs, therefore, are not qualified to sue, and have, in fact, no legal rights that can be made the subject of a suit. Moreover, it is urged that the plaintiffs to do not come into court with clean hands; that they are members of an organization lately engaged in boycotting the defendants, and attempting to ruin their business; that the label itself can not be approved, either in law or morals, as it denounces other cigars than union-made ones as inferior and unwholesome, and the product of filthy tenement houses, or made by coolies and convicts.

And, first, we may admit that the label is not used as a "trade-mark," in the ordinary sense of that word. It is not a brand put upon the goods of the owner, to separate or distinguish them from the goods of others. But we can not agree, on that account, that it does not represent a valuable right, which may be the subject of legal protection. Why may not those engaged in skillful employments so designate the result of their labor as to entitle them to the fruits of their skill, when it is admittedly a source of pecuniary profit to them? And this though they may not own the property itself. They are not, it is true, "in business" for themselves, in the ordinary sense; but they have property rights, nevertheless. They may not select a label, and be protected in its use apart from its connection with some commodity; but they not only select it in this instance, but they apply it to property, and it does not at all matter that the tangible property is that of another. In order to get the benefit of the superior reputation of cigars made by them, the appellees select and apply this label, as a distinguishing brand or

mark; and it would be strange if this thing of value—this certificate of good workmanship, which makes the goods made by them sell, and thus increases the demand for their work—should be entitled to no protection, because those making the selection and application are not business men engaged in selling cigars of their own. The man who is employed for wages is as much a business man as his employer, in the larger sense in which the word "business" has come to be used by statesmen and legislators. In a number of the states, laws have been enacted giving protection to the men engaged in the business of working for wages; and their right of organizing and selecting appropriate symbols to designate the result of their handiwork is recognized, and ordained to be the subject of lawful protection, by the court. Thus, in this state, in April, 1890, a law was enacted by the general assembly providing that "every union or association of working men or women adopting a label, mark, name, brand or device intended to designate the product of the labor of the members of such union, shall file duplicate copies of such label in the office of the secretary of state, who shall then give them a certificate of the filing thereof," and that "every such union may by suit in any of the courts of the state, proceed to enjoin the manufacture, use, display," etc., "of counterfeits or imitations of such labels," etc., "on goods bearing the same, and that the court having jurisdiction of the parties shall grant an injunction restraining such wrongful manufacture, use," etc., "of such labels," etc. This suit was filed before the adoption of this statute, but it indicates the policy of the law, and the growth or expansion, and perhaps the creation, of legal remedies hardly known to ancient trade-mark law. The learned chancellor below, in an exhaustive opinion, reviewing all the authorities, among other things, said (and we can say it no more clearly) that: "The known reputation of a particular kind of skilled labor, employed in the development of a particular product or class of products, determines, to a large degree, the value or price of such products when put on the markets. To stamp or label a commodity as the product of a particular kind or class of skilled labor, determines the demand for, and the price of, such product or commodity. The marketable price of a commodity influences the scale of wages paid for its manufacture. The higher the price, the higher the wages paid. Hence it is indisputable that the employee, whose skilled labor in the production of a particular commodity creates a demand for the same that secures for him higher, remunerative wages, has as definite a property right to the exclusive use of a particular label, sign, symbol, brand, or device, adopted by him to distinguish and characterize said commodity as the product of his skilled labor, as the merchant or owner has to the exclusive use of his adopted trade-mark on his goods."

In Cohn *v.* People, 149 Ill., 486, 37 N. E., 60, the court upheld the constitutionality of the trades-union act in that state; and as the court, independently of the statute, disposed of one of the contentions of counsel in the case, which is also relied on here, we quote, in part, its argument: "It is next objected that the label, an imitation and counterfeit of which is alleged to have been unlawfully used by plaintiff in error, could not have been rightfully adopted either as a label, trade-

mark, or form of advertisement. It is said that it transgresses the rules of morality and public policy. . . . By reference to the label, heretofore set out, it will be seen that it is a certificate signed by the president of the Cigar Makers' International Union of America, certifying that the cigars contained in the box upon which it was placed were 'made by a first-class workman, a member of the Cigar Makers' International Union of America, an organization opposed to inferior, rat-shop, cooly, prison, or filthy tenement-house workmanship.' And it concludes: 'Therefore we recommend these cigars to all smokers throughout the world.' The purpose, as derived from the label itself, is to send the cigars out to the public with the assurance that they are made by a first-class workman, who belongs to an order opposed to the inferior workmanship designated. It will be observed that the label attacks no other manufacturer of cigars. It says, simply, in effect, 'These cigars are not the product of an inferior, rat-shop, cooly, prison, or filthy tenement-house workmanship.' Can it be said that one may not, without condemning or aspersing the product of other manufacturers, commend the article he has for sale? If he may do so himself, may he not procure the certificate of others as to the quality of the article he puts upon the market?"

Further, we agree with the learned chancellor that there is no competent evidence that the appellees, or any of them, have been engaged in boycotting the appellants, and thus depriving themselves of the right to enforce their legal remedies in a court of equity. Whatever may be said of the letters and circulars looking to this end, and exhibited in the proof, it is not shown by any competent proof that the appellees instigated, or had aught to do with, the attempted boycott. And, moreover, this boycott, which seems to have occurred in 1886, did not in any way grow out of the wrongful use of the label in controversy. On the whole case, therefore, we are of opinion that the law may be justly invoked by organized labor to protect from piracy and intrusion the fruits of its skill and handiwork, and that brain and muscle may be the subject of trade-law rules, as well as tangible property. The judgment is affirmed.

Seamen's Wages.—*Krueger et al. v. The John and Winthrop, 84 Federal Reporter, page 503.*—This was a libel by F. A. Krueger and others against the American bark *John and Winthrop* to recover seamen's wages, brought in the United States district court for the northern district of California. The defense to the action was that the libelants had shipped for an entire whaling voyage, and while on such voyage attempted to burn and destroy the vessel, and for that offense the captain, after such investigation as he though sufficient, suspended the libelants from duty, and imprisoned them on board of the vessel. Upon the trial the captain testified that such action was, in his judgment, necessary for the safety of the vessel. The captain did not, however, of his own knowledge, know that the libelants were in fact guilty of the offense charged against them.

The decision of the district court was rendered December 29, 1897, and allowed the wages claimed. The opinion was delivered by District Judge De Haven, and reads as follows:

The evidence in this case is not such as would warrant the court in finding that the libelants, or either of them, attempted to burn and destroy said bark, *John and Winthrop*, and thus to break up the voyage for which they shipped as seamen on board of said vessel. The fact, if it be a fact, that the captain, in suspending the libelants from duty and imprisoning them on board the ship, acting in good faith, under the belief that they were guilty of attempting to destroy the vessel, is not of itself sufficient to defeat the claims of the libelants in this action. The good faith of the master in that matter would be important, if the libelants were seeking to recover damages for assault or false imprisonment; but in this action, based on the contract set out in the shipping articles, the libelants are entitled to recover if they are not in fact guilty of the charge of attempting to set fire to the vessel. There will be a decree for the libelants.

SEAMEN'S WAGES—COMPLETION OF VOYAGE.—*Heinrici et al. v. The Laura Madsen et al., 84 Federal Reporter, page 362.*—This case was brought in the United States district court for the southern district of California to recover seamen's wages. The libelants at San Francisco, Cal., on March 29, 1897, entered into and duly executed articles of agreement with the master of the schooner *Laura Madsen*, upon the terms and conditions set forth in the shipping articles, a part of which reads as follows: "The schooner *Laura Madsen*, of San Francisco, Cal., . . . now bound from the port of San Francisco, Cal., to Port Blakeley, thence to San Francisco for final discharge, either direct or via one or more ports on the Pacific coast. Either north or south of the port of discharge. Voyage to be repeated one or more times." Another material provision of said articles was as follows: "It is especially understood and agreed that the wages of the said crew shall not be due, nor any part thereof, nor shall the crew be entitled to receive any portion of their pay, except at the master's option, until the completion of the entire voyage above described; and that, in case any of the crew leave the vessel before the completion of the voyage as aforesaid, the persons so leaving shall forfeit to the owners of the said vessel all the wages due them."

The vessel entered upon the voyage from San Francisco and proceeded direct to Port Blakeley, in the state of Washington, where she loaded with a cargo of lumber, and thence sailed direct to the port of San Pedro, in the state of California. After discharge of cargo there the master announced to the seamen his purpose of sailing direct to Port Blakeley, and they then and there demanded their wages, but payment was refused. They remained while the vessel took in ballast

and assisted in the same, and after that they again demanded their pay. The master refused to pay them, claiming that the voyage had not been ended and that they were not entitled to their wages. The seamen then and there left the vessel without the master's consent, claiming that the voyage was completed and that they were entitled to their wages.

The decision of the court awarding wages to the seamen was rendered November 1, 1897, and from the opinion, delivered by district Judge Wellborn, the following is quoted:

Libelants contend that they had a right to leave the vessel at the time and place they did, for the reason, among others, that the voyage for which they shipped did not include a return from San Pedro to Port Blakeley; and therefore, when the announcement was made to them by the master of the vessel of his intention to return to Port Blakeley, they were justified in leaving said vessel. Respondents insist that libelants, by leaving the vessel at San Pedro, were guilty of desertion, and therefore forfeited their wages.

If it be conceded (which, however, I do not decide) that the shipping articles allowed the vessel to go from Port Blakeley to San Pedro, no fair construction of the articles would permit the return from San Pedro to Port Blakeley. The voyage is expressly described as being from San Francisco to Port Blakeley, thence to San Francisco, etc. Certainly this language does not imply that the vessel could go from Port Blakeley to some other point, as for instance, San Pedro, and return to Port Blakeley. Whatever may be the true construction of the shipping articles as to the ports at which the vessel could touch in going from Port Blakeley to San Francisco, it is clear that the articles did not permit a return to Port Blakeley from any intermediate port before San Francisco had been reached. A decree for libelants will be entered.

SEAMEN'S WAGES—LEAVING VESSEL—ABUSIVE TREATMENT.—*Richards et al. v. The Topgallant, 84 Federal Reporter, page 356.*—This was a libel *in rem* against the bark *Topgallant* to recover seamen's wages, heard in the United States district court for the district of Washington, northern division. The following decision of the court was rendered January 3, 1898, by District Judge Hanford:

The libelants shipped at San Francisco for a voyage to Puget Sound and return, and they proceeded in the vessel from San Francisco to Port Blakeley, and thence to Seattle, and, while at Seattle, engaged in taking in cargo, there was difficulty between them and the captain. The captain had given orders to the first mate to move the vessel to a different position for convenience in receiving coal, and the mate neglected to have this done until after working hours. After seven o'clock in the evening the mate asked the men if they would then haul the ship, to which they answered that they would not, and the vessel was not moved that night, and in consequence of this neglect she was delayed in lading. The captain was absent from the ship from the time

of giving the order to the mate to the next morning. On being informed by the mate that the men had refused to haul the ship when requested, he reprimanded the crew, and ordered a discontinuance of coffee and a luncheon, which, until that time, during the loading of the vessel, had been served to the men at nine o'clock in the forenoon, as an extra in addition to the regular breakfast, dinner, and supper. There is a conflict in the testimony as to the conduct and exact words of the captain at this time, and as to threats which the men allege he made of future severity. A day or two after this occurrence, these libelants informed the captain that they wished to leave the ship, and asked him for their wages, which he refused to pay. He informed them, however, that they could leave the vessel if they wished to, but that, if they did leave, he would not pay them their wages. The libelants did leave the vessel.

It is my opinion that the libelants were not justified in leaving the vessel before termination of the voyage for which they shipped, by reason of abusive treatment at the hands of the captain; neither was their conduct disobedient or insolent to such a degree as to authorize the captain to discharge them, and claim forfeiture of their wages. The libelants, however, wished to leave the vessel, and so informed the captain; therefore they cannot claim that by telling them to go the captain discharged them unjustly, so as to entitle them to wages for the entire voyage. Upon being told by the captain that they could leave the vessel, they had a right to take him at his word, so that their contract for services in the vessel was, in effect, terminated by mutual consent. The captain seems to have acted upon a mistaken idea that the wages of seamen are forfeited by quitting the service before fulfillment of the entire contract, even when in doing so there is no disobedience. But in law seamen can not be treated as deserters, and their wages forfeited, unless they leave the vessel, and remain absent, without leave of the commander. The rule is that, when the seamen's contract is terminated before conclusion, by mutual assent, the seamen are entitled to wages for the time of their actual service at the rate fixed by their contract. If the captain discharges them before the termination of the voyage, without justifiable cause, they are entitled to wages for the entire voyage, and the amount of their expenses in returning to the port of discharge. Deserters from a vessel are not entitled to anything.

NEW HAMPSHIRE LABOR LAWS.

LABOR COMMITTEE, HOUSE OF REPRESENTATIVES,

LEGISLATURE OF 1897-98.

NEW HAMPSHIRE LABOR LAWS.

PUBLIC STATUTES OF 1891.

Chapter 11.—College of Agriculture and Mechanic Arts.

Section 1. The state agricultural college, located at Hanover, is a corporation by the name of The New Hampshire College of Agriculture and the Mechanic Arts.

Sect. 2. The leading object of the college is, without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in conformity to an act of congress entitled, "An act donating land to the several states and territories which may provide colleges for the benefit of agriculture and the mechanic arts," approved July 2, 1862.

Chapter 55.—Exemption from Taxation.

Sect. 7. Personal estate liable to be taxed is,—

* * * * * * * * * *

VI. Stock in trade, whether of merchants, shopkeepers, mechanics, or tradesmen, employed in their trade or business, reckoning the same at the average value thereof for the year; and for purposes of taxation, raw materials and manufactures of any manufactory, wood, timber, logs, and lumber, manufactured or otherwise, if exceeding fifty dollars in value, and fishing vessels, steamboats, horse-boats, or other vessels owned by individuals and navigating the waters of the state for the transportation of passengers or freight, and seagoing vessels shall be deemed stock in trade.

VII. Carriages, if exceeding fifty dollars in value.

VIII. Horses, asses, and mules over eighteen months old.

IX. Oxen, cows, and other neat stock over eighteen months old.

X. Sheep and hogs over six months old; but two such hogs to each family shall be exempt from taxation.

XI. Fowls of every description exceeding fifty dollars in value.

Chapter 60.—Exemption from Distress for Unpaid Taxes.

Sect. 4. Upon neglect or refusal of any person or corporation to pay the taxes assessed upon them, the collector may distrain the goods and chattels of such person or corporation.

SECT. 5. No distress shall be made of any person's tools or implements necessary for his trade or occupation, nor of his arms, nor of household utensils necessary for upholding life, nor of bedding or apparel necessary for him or his family.

CHAPTER 92.—FREE TEXT-BOOKS IN PUBLIC SCHOOLS.

SECT. 7. They (the school board) shall purchase, at the expense of the city or town in which the district is situated, text-books and other supplies required for use in the public schools; and shall loan the same to the pupils of such schools free of charge, subject to such regulations for their care and custody as the school board may prescribe.

CHAPTER 92.—ENFORCEMENT OF LAWS REGULATING EMPLOYMENT OF CHILDREN.

SECT. 15. School boards are authorized to appoint truant officers for their districts, and to fix their compensation at a reasonable rate, which compensation shall be paid by the towns.

SECT. 17. Truant officers shall, under the direction of the school board, enforce the laws and regulations relating to truants and children between the ages of six and sixteen years not attending school and without any regular and lawful occupation.

SECT. 18. Truant officers shall, if required by the school board, enforce the laws prohibiting the employment of children in manufacturing establishments who have not attended school the prescribed time.

CHAPTER 93.—EMPLOYMENT OF CHILDREN.

SECT. 10. No child under the age of ten years shall be employed in any manufacturing establishment.

SECT. 11. No child under the age of sixteen years who can not read and write shall be employed in any manufacturing establishment during the time the public schools in the district in which he resides are in session.

SECT. 12. Children not included under the provisions of the preceding section shall not be employed in a manufacturing establishment unless they shall first furnish to the person proposing to employ them a certificate of the school board of the district in which they reside that they have attended some public or private day school in which the common English branches are taught during the preceding year as follows: If under sixteen and over fourteen years of age, twelve weeks; if under fourteen and over twelve years of age, six months, or such part thereof

as the schools in the district in which they reside were in session; and if under twelve and over ten years of age, the whole time the schools were in session in such district.

SECT. 13. If any owner, agent, superintendent, or overseer of a manufacturing establishment shall employ any child in violation of the provisions of either of the three preceding sections, he shall be fined not exceeding fifty dollars for each offense, for the use of the district.

SECT. 18. It shall be the duty of the school board to prosecute offenders for violations of the provisions of this chapter. If they neglect to perform this duty they shall forfeit twenty dollars for each neglect, for the use of the district, to be recovered in the name of the district by the selectmen of the town. All necessary expenses incurred in such proceedings shall be paid by the district.

SECT. 19. No prosecution under this chapter shall be sustained unless begun within one year after the offense was committed.

CHAPTER 108.—FACTORIES AND WORKSHOPS, ETC.—SANITARY PROVISIONS.

SECT. 8. No person shall occupy, lease to any other person, or permit any other person to occupy, a building or any part of a building within the compact part of a city or town as a dwelling-house, office, store, shop, or sleeping apartment, unless such building shall be provided with suitable privies and vaults properly ventilated and constructed, and kept in proper sanitary condition, and in case of occupancy as a dwelling-house, unless it shall be provided with suitable drains or sewers for conveying the sink water away from the premises into some public sewer, if there be one within one hundred feet thereof, and if not, for conveying it away under ground, or in some other way that will not be offensive.

SECT. 9. Any person neglecting or refusing to comply with the provisions of the preceding section shall be fined not exceeding ten dollars for each day of neglect or refusal, after notice as provided in section four of this chapter.

SECT. 18. Whenever a . . . tenement, . . . or any cellar or other appurtenance connected therewith, has become a source of danger to the health of its occupants or others from want of cleanliness, the health officers may order the owner, his agents, or the occupants, or any of them, to cleanse and put the same in proper sanitary condition, and the occupants to quit the same, within a time limited. . . . If any person shall fail to comply with an order of the health officers made under the authority of this section, after receiving due notice thereof, he shall forfeit ten dollars, for the use of the town, or be imprisoned not more than thirty days.

CHAPTER 116.—CONSTRUCTION OF FACTORIES, TENEMENT HOUSES, ETC.

SECTION 1. Towns and village districts may make by-laws requiring factories, . . . tenement houses, . . . to be provided with ample means for escape in case of fire, and adequate facilities for entrance and exit on all occasions, and to be so erected as not to endanger the health and safety of persons who may occupy them; and they may provide thereby for the inspection of such buildings.

SECT. 2. In the absence of such by-laws, the selectmen shall make regulations for the purposes named in the preceding section.

SECT. 3. The firewards and engineers, if any, otherwise the selectmen of the town or the commissioners of the village district, as the case may be, shall constitute a board for the inspection of the buildings and halls mentioned in the first section of this chapter, and shall inspect the same from time to time.

SECT. 4. They shall notify and hear all parties interested, and may thereupon direct such alterations as may be necessary in any building or hall, in accordance with such by-laws or regulations, and may order such building or hall to be closed until the alterations are made. The proceedings of such hearing shall be recorded in the records of the town or district.

SECT. 5. Every person who shall let or use any building for the purposes specified in this act, after such building shall have been ordered to be closed or altered as provided in the preceding sections, until the order has been complied with or reversed, shall be punished by fine not exceeding one hundred dollars, for the use of the town or district where the building is situated.

CHAPTER 119.—INSPECTION, ETC., OF STEAMBOATS.

SECTION 1. The governor, with advice of the council, shall appoint one or more inspectors of steamboats, whose duty it shall be to inspect all steamboats and the boilers and engines thereof, used for the carriage of passengers for hire on any lake, river, or pond in the state not subject to the authority in this respect of the United States inspection laws, or where inspections under such laws are not regularly made.

SECT. 2 (as amended by chapter 6, acts of 1895). The owners or lessees of every such boat shall cause it to be inspected by an inspector in all its parts, its engines and its boilers, annually, within thirty days prior to engaging in the carriage of passengers.

SECT. 3. If upon such inspection the inspector finds the boat, its boilers and engines, to be safe and sufficient for the carriage of passen-

gers, he shall prescribe the maximum number of passengers the boat may carry at any one time, and such other rules and regulations as may seem to him proper for such boat, and he shall give the owners or lessees a certificate and license accordingly.

SECT. 4. The owners or lessees of every such boat shall cause a copy of the rules and regulations so established for it to be posted in a conspicuous place on the boat.

SECT. 5. An inspector shall examine such boat, its boilers and engines, at such other times as he shall deem the public interest and safety require, not exceeding three times in any year, to see if the provisions of law and the rules and regulations established for the boat have been complied with.

SECT. 6. If any steamboat licensed as aforesaid shall, during the period of its license, be deemed by an inspector unsafe in its hull, or defective in its engine, boilers, or machinery, or if its owners or lessees shall have failed to comply with the rules and regulations prescribed by the inspector, he shall have power to revoke its license and stop and detain the boat until the necessary repairs have been made, or until the rules and regulations have been complied with, and shall then issue a new certificate or license.

SECT. 7. The owners or lessees of any steamboat licensed to carry passengers, as provided in this chapter, shall not employ any engineer or pilot upon said boat unless such engineer or pilot has been examined by an inspector of steamboats and has a certificate from him that he is competent to act in that capacity.

SECT. 8. All engineers and pilots shall be examined by the inspectors as to their competency, under oath; and power to administer oaths in such cases is granted to inspectors.

SECT. 9. If any person shall use any such steamboat for the carriage of passengers which, with its boilers and engines, has not been inspected and licensed as provided in this chapter, or shall employ upon any such steamboat any engineer or pilot who has not been examined and licensed as required by the preceding sections, he shall be fined not exceeding one hundred dollars or be imprisoned not exceeding one year, or both.

SECT. 11. If any person shall act as engineer or pilot on any steamboat without the certificate herein required; or if any engineer or pilot shall, during the period for which he is licensed, neglect his duties or be of intemperate habits, or violate any of the rules and regulations established by the inspector; or if any engineer shall carry more steam than the certificate for his boat allows, or shall in any way or manner interfere with the locked safety-valve of the boiler, after the same has been set by

the inspector, so as to allow greater pressure in the boiler than the amount specified by the certificate,—his license may be suspended or revoked by the inspector, and he shall be punished by fine not exceeding one hundred dollars, or by imprisonment not exceeding one year, or by both.

SECT. 12. If any inspector of steamboats, upon any pretense, receives any fee or reward for his services except what is allowed to him by law, he shall forfeit his office, and be punished by a fine not exceeding five hundred dollars, or by imprisonment not exceeding six months, or by both.

CHAPTER 138.—EXEMPTION FROM EXECUTION, ETC.—HOMESTEADS.

SECTION 1. Every person is entitled to five hundred dollars worth of his homestead, or of his interest therein, as a homestead right.

SECT. 3. The homestead right is exempt from attachment, during its continuance, from levy or sale on execution, and from liability to be incumbered or taken for the payment of debts, except in the following cases: 1. In the collection of taxes; 2. In the enforcement of liens of mechanics and others for debts created in the construction, repair, or improvement of the homestead; 3. In the enforcement of mortgages which are made a charge thereon according to law; 4. In the levy of executions as provided in this chapter.

CHAPTER 140.—CONDITIONAL SALES OF PERSONAL PROPERTY.

SECT. 23. No lien reserved on personal property sold conditionally and passing into the hands of the conditional purchaser, except a lien upon household goods created by a lease thereof, containing an option in favor of the lessee to purchase the same at a time specified, shall be valid against attaching creditors, or subsequent purchasers, without notice, unless the vender of such property takes a written memorandum, signed by the purchaser, witnessing the lien, the sum due thereon, and containing an affidavit as provided in the following section, and causes such memorandum to be recorded in the town clerk's office of the town,

I. Where the purchaser resides, if within this state; or

II. Where the vendor resides, if within this state, and the purchaser does not reside in the state; or

III. Where the property is situated, if neither purchaser nor vendor resides in the state.

SECT. 24. Each vendor and purchaser shall make and subscribe an affidavit in substance as follows: "We severally swear that the foregoing memorandum is made for the purpose of witnessing the lien and the

sum due thereon, as specified in said memorandum, and for no other purpose whatever, and that said lien and the sum due thereon were not created for the purpose of enabling the purchaser to execute said memorandum, but said lien is a just lien, and the sum stated to be due thereon is honestly due thereon and owing from the purchaser to the vendor."

SECT. 25. When co-partners or corporations are parties to such a memorandum, the affidavit may be made and subscribed as in case of mortgages of personal property.

SECT. 26. If the record required by section twenty-three is made within twenty days after the property is delivered, the lien reserved shall be valid against all attaching creditors and purchasers; but if it is not made until after the expiration of twenty days, it shall be valid against those attaching creditors and purchasers only who become such after the record.

CHAPTER 141.—MECHANICS' LIENS.

SECT. 9. If a person shall, by himself or others, perform labor or furnish materials towards building, repairing, fitting, or furnishing a vessel within this state, payment for which is due, he shall have a lien therefor on the vessel for the space of four days after it is completed.

SECT. 10. If a person shall, by himself or others, perform labor or furnish materials to the amount of fifteen dollars or more, for erecting, altering, or repairing a house or other buildings or appurtenances, by virtue of a contract with the owner thereof, he shall have a lien thereon, and any right of the owner to the lot of land on which the houses, building, or appurtenance stand.

SECT. 11. If a person shall perform labor or furnish materials to the amount of fifteen dollars or more for making brick, by virtue of a contract with the owner thereof, he shall have a lien upon the kiln containing such brick for such labor or materials.

SECT. 12. If any person shall by himself or others, or by teams, perform labor or furnish supplies to the amount of fifteen dollars or more, toward rafting, driving, cutting, hauling, or drawing wood, bark, lumber, or logs, or toward cooking or hauling supplies in aid of such labor, by virtue of a contract with the owner of the wood, bark, lumber, or logs, he shall have a lien thereon for such labor or supplies.

SECT. 13. If a person shall, by himself or others, perform labor or furnish materials to the amount of fifteen dollars or more for any purpose specified in the three preceding sections, by virtue of a contract with an agent, contractor, or sub-contractor of the owner, he shall have the same lien as provided in said sections, provided he gave notice in

writing to the owner, or to the person having charge of the property, that he should claim such lien before performing the labor or furnishing the materials for which it is claimed.

SECT. 14. If a person shall, by himself or others, perform labor or furnish materials to the amount of fifteen dollars or more, in the grading, masonry, bridging, or track-laying of a railroad, under a contract with an agent, contractor, or sub-contractor of the proprietors thereof, he shall have a lien upon the railroad and the land upon which it is constructed, provided he gave notice in writing to such proprietors, or to the person having charge of the railroad, that he should claim such lien before performing the labor or furnishing the materials for which it is claimed.

SECT. 15. Any person giving notice as provided in the two preceding sections, shall, as often as once in thirty days, furnish to the owner or person having charge of the property on which the lien is claimed, an account in writing of the labor performed or materials furnished during the thirty days; and the owner or person in charge shall retain a sufficient sum of money to pay such claim, and shall not be liable to the agent, contractors, or sub-contractors therefor, unless the agent, contractor, or sub-contractor shall first pay it.

SECT. 16. The lien created by sections ten, eleven, twelve, thirteen, and fourteen of this chapter shall continue for ninety days after the services are performed, or the materials or supplies are furnished, unless payment therefor is previously made, and shall take precedence of all prior claims except liens on account of taxes.

SECT. 17. Any such lien may be secured by attachment of the property upon which it exists at any time while the lien continues,—the writ and return thereon distinctly expressing that purpose; and such attachment shall have precedence of all other attachments made after such lien accrued, unless founded on a prior lien. If logs are attached, the officer making the attachment may pay the boomage thereon, if any, and return the amount so paid on the writ, and it shall be included in the costs recovered.

SECT. 18. No lien shall be defeated by taking a note, unless it was taken in discharge of the amount due and of the lien.

CHAPTER 159.—ERECTION OF BRIDGE GUARDS BY RAILROADS.

SECT. 26. The proprietors of every railroad shall erect and maintain bridge guards at each end of every bridge or other structure erected less than eighteen feet above the track of their railroad, the character and location of which shall be approved by the board of railroad commissioners.

SECT. 27. If the proprietors of any railroad shall fail to comply with the provisions of the preceding section, they shall forfeit fifty dollars for each month of continuance in such failure.

SECT. 28. If any person shall willfully destroy or injure any such bridge guard he shall be fined not exceeding one hundred dollars, or be imprisoned not exceeding thirty days.

CHAPTER 176.—EARNINGS OF MARRIED WOMEN.

SECTION 1. Every woman shall hold to her own use, free from the interference or control of any husband she may have, all property at any time earned, . . . if such earning, . . . were not occasioned by payment or pledge of the property of the husband.

CHAPTER 180.—EMPLOYMENT, HOURS OF LABOR, ETC., OF WOMEN AND CHILDREN.

SECT. 14. No woman and no minor under eighteen years of age shall be employed in a manufacturing or mechanical establishment for more than ten hours in one day, except in the following cases:

I. To make a shorter day's work for one day in the week.

II. To make up time lost on some day in the same week in consequence of the stopping of machinery upon which such person was dependent for employment.

III. When it is necessary to make repairs to prevent interruption of the ordinary running of the machinery.

In no case shall the hours of labor exceed sixty in one week.

SECT. 15. The proprietors of every such establishment shall keep posted in a conspicuous place in every room where such persons are employed a notice printed in plain, large letters, stating the exact time of beginning and of stopping work in the forenoon and in the afternoon, and the number of hours' work required of them each day of the week.

SECT. 16. If any owner, agent, superintendent, or overseer of any such establishment shall willfully violate the provisions of either of the two preceding sections, he shall be fined not exceeding fifty dollars for each offense.

SECT. 17. A certificate of the age of a minor, made by him and by his parents or guardian and presented to the employer at the time the minor is employed, shall be conclusive evidence of his age upon a prosecution for the violation of the provisions of section fourteen.

SECT. 18. If any person shall make and utter a false certificate in regard to the age of a minor, with intent to evade the provisions of this

chapter, he shall be fined twenty-five dollars, or be imprisoned thirty days, or both, for each offense.

SECT. 19. All such fines shall be one half for the use of the complainant, and the other half for the use of the county. Prosecutions under sections sixteen and eighteen shall be barred unless begun within one year after the offense was committed.

CHAPTER 180.—HOURS OF LABOR.

SECT 20. In all contracts relating to labor, ten hours' actual labor shall be taken to be a day's work, unless otherwise agreed by the parties.

CHAPTER 180.—PAYMENT OF WAGES.

SECT. 21. Every manufacturing, mining, quarrying, stone-cutting, mercantile, horse-railroad, telegraph, telephone, express, aqueduct, and municipal corporation employing more than ten persons at one time shall pay the wages earned each week by their employees who work by the day or week within eight days after the expiration of the week, or upon demand after that time. Every such corporation shall post a notice in a conspicuous place in its office that it will pay its employees' wages as above, and shall keep the same so posted.

SECT. 22. If any such corporation shall violate the provisions of the preceding section, it shall be fined not more than twenty-five dollars for each offense, provided a prosecution therefor is begun within thirty days after the offense is committed, but not otherwise.

SECT. 23. The provisions of the two preceding sections shall not apply to municipal officers whose services are paid for by the day, nor to teachers employed by school districts.

CHAPTER 180.—LABOR DAY.

SECT. 24. The first Monday of September of each year shall be a holiday to be known as Labor day.

CHAPTER 201.—INSOLVENCY PROCEEDINGS NOT TO AFFECT LIENS FOR LABOR.

SECT. 26. . . . The provisions of this section [relating to proceedings in insolvency] shall not affect any existing lien for labor performed or materials furnished, or any proceedings to enforce the same.

CHAPTER 201.—WAGES PREFERRED—IN ASSIGNMENTS.

SECT. 32. The following claims are entitled to priority, and shall be paid in full in the order named:

I. Debts due the United States, and all taxes.

II. Wages due an operative, clerk, or servant, not exceeding fifty dollars, for labor performed within six months prior to the beginning of the insolvency proceedings.

III. Taxable costs in any suit begun in good faith in which an attachment is dissolved by the insolvency proceedings.

Chapter 215.—Assignment of Future Earnings.

Sect. 4. No assignment of, or order for, wages to be earned in the future shall be valid against a creditor of the person making it, until it has been accepted in writing and a copy of it and of the acceptance has been filed with the clerk of the town or city where the party making it resides. The clerks of towns and cities shall keep for public inspection an alphabetical list of all such orders and assignments filed with them.

Chapter 220.—Exemption from Execution, etc.—Personal Property.

Sect. 2. The following goods and property are exempted from attachment and execution:

I. The wearing apparel necessary for the use of the debtor and his family.

II. Comfortable beds, bedsteads, and bedding necessary for the debtor, his wife and children.

III. Household furniture to the value of one hundred dollars.

IV. One cooking-stove and the necessary furniture belonging to the same.

V. One sewing-machine, kept for use by the debtor or his family.

VI. Provisions and fuel to the value of fifty dollars.

VII. The Bibles, school books, and library of any debtor used by him or his family, to the value of two hundred dollars.

IX. Tools of his occupation to the value of one hundred dollars.

X. One hog and one pig, and the pork of the same when slaughtered.

XI. Six sheep and the fleeces of the same.

XII. One cow; a yoke of oxen or a horse, when required for farming or teaming purposes, or other actual use; and hay not exceeding four tons.

XIII. Domestic fowls not exceeding fifty dollars in value.

XIV. The debtor's interest in one pew in any meeting-house in which he or his family usually worship.

XV. The debtor's interest in one lot or right of burial in any cemetery.

CHAPTER 245.—EXEMPTION FROM TRUSTEE PROCESS—WAGES.

SECT. 20. The money, rights, and credits of the defendant shall be exempt from trustee process in the following instances, and the trustee shall not be chargeable therefor:

I. Wages for labor performed by the defendant after the service of the writ upon the trustee.

II. Wages of the defendant earned before the service of the writ upon the trustee, to the amount of twenty dollars, except in actions brought to recover for necessaries furnished to the defendant or any of his family.

III. Wages for the personal services and earnings of the wife and minor children of the defendant.

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CHAPTER 265.—CERTAIN EMPLOYMENTS OF CHILDREN FORBIDDEN.

SECT. 3. If any person shall employ or exhibit a child under the age of fourteen years in dancing, playing on musical instruments, singing, walking on a wire or rope, or ridng or performing as a gymnast, contortionist, or acrobat in any circus or theatrical exhibition, or in any public place whatsoever, or shall cause, procure, or encourage any such child to engage therein, or if any person having the custody or control of any such child, shall permit him to be so employed, such person shall be fined not exceeding one hundred dollars; but nothing in this section shall be construed to prevent the education of children in vocal and instrumental music, or their employment as musicians in any church, chapel, or school, or school exhibition, or to prevent their taking part in any concert or musical exhibition.

CHAPTER 266.—RAILROADS—OBSTRUCTING, INJURING PROPERTY OF, ETC.

SECTION 1. If any person shall willfully and maliciously place any obstruction on the track of any railroad, or remove any rail therefrom, or in any way injure such railroad, or do any other thing thereto whereby the life of any person may be endangered, he shall be imprisoned not exceeding twenty years.

SECT. 2. If any person shall maliciously or wantonly stop, hinder, or delay, or by any false alarm or signal cause to be stopped, hindered, or delayed, or shall in any manner maliciously or wantonly interfere with the running, management, or control of any railroad train, car, or locomotive, he shall be fined not exceeding one thousand dollars, or be

imprisoned not exceeding ten years, or both. This section shall not apply to horse railroads.

SECT. 3. If any person shall willfully and maliciously injure, destroy, or damage any rails, culverts, tracks, platforms, or other parts or appendages of any railroad, or any engines or cars used thereon, or change, move, open, displace, or tamper with any switch belonging thereto, he shall be fined not exceeding five hundred dollars, or be imprisoned not exceeding two years, or both.

SECT. 4. If any person shall willfully displace, injure, deface, remove, or destroy any warning sign at a railroad crossing, or any signal light, or appliance used to denote the place of any switch upon any railroad, or any gate or apparatus connected therewith at any railroad crossing, he shall be fined not exceeding one hundred dollars, or be imprisoned not exceeding one year, or both.

SECT. 6. If any person shall willfully and maliciously injure or destroy any of the posts, wires, or other materials or fixtures of any railroad telegraph, or public telegraph line, or public telephone line, he shall be fined not exceeding five hundred dollars, or be imprisoned not exceeding two years, or both.

CHAPTER 266.—INTIMIDATIONS, ETC., OF EMPLOYERS OR EMPLOYEES.

SECT. 12. If any person shall interfere in any way whatever to injure or damage another in his person or property, while engaged in his lawful business, trade, or occupation, or while on the way to or from the same, or shall endeavor to prevent any person from engaging in his lawful business, trade, or calling, he shall be fined not exceeding five hundred dollars, or be imprisoned not exceeding one year.

CHAPTER 271.—SUNDAY LABOR.

SECT. 3. No person shall do any work, business, or labor of his secular calling, to the disturbance of others, on the first day of the week, commonly called the Lord's day, except works of necessity and mercy, and the making of necessary repairs upon mills and factories which could not be made otherwise without loss to operatives, and no person shall engage in any play, game, or sport on that day.

SECT. 5. No person shall keep his shop, warehouse, cellar, restaurant, or workshop open for the reception of company, or shall sell or expose for sale any merchandise whatsoever on the Lord's day; but this section shall not be construed to prevent the entertainment of boarders, nor the sale of milk, bread, and other necessaries of life, nor drugs and medicines.

SECT. 10. If any person shall be guilty of a breach of any provision of this chapter, he shall be fined not exceeding ten dollars or be imprisoned not exceeding thirty days, or both, unless otherwise specially provided, and he may be required to give sureties to be of good behavior for one year.

SECT. 13. No prosecution for the violation of any provision of this chapter shall be sustained unless begun within thirty days after the commission of the offense.

CHAPTER 282.—CONVICT LABOR.

SECT. 14. The sheriff of any county may, with the approval of the county commissioners, employ and set to labor any prisoner confined in the county jail, in such manner as shall be consistent with his safe keeping, if the labor can be prosecuted without expense to the county.

ACTS OF 1893.

CHAPTER 39.—PROTECTION OF RAILROAD EMPLOYEES.—HEIGHT OF BRIDGES AND FREIGHT CARS.

SECTION 1. The board of railroad commissioners may require the proprietors of a railroad to raise any railroad bridge and any overhead highway bridge, and in case of a highway bridge to change the approaches thereto so as to make them as nearly level as practicable. Whenever it is necessary, in complying with such requirement of the commissioners, to raise or lower or otherwise change the location of the highway outside the railroad location, any land needed for that purpose shall be taken and the damage, if any, to landowners shall be appraised and paid, in the manner described in chapter 158 of the Public Statutes. Any party aggrieved by such appraisal shall have a right of appeal as provided in said chapter. The expense of such improvements shall be paid in the first instance by the railroad corporation, but upon its petition, the commissioners may apportion such part of the cost outside the railroad location, as in their judgment is just, to the city or town, and the railroad may recover the amount so apportioned in an action of debt. Proceedings under this act shall only be had after due notice to the railroad corporation, the town or city officials, and the landowners, and all orders and findings of the commissioners shall be filed with the clerk of the town or city in which such bridge is located, and served upon the railroad corporation.

SECT. 2. No covered railroad bridge shall hereafter be constructed in this state with less than twenty-one feet between the top of the rails, and the lowest point of the overhead structure, except with the written consent of the railroad commissioners, said consent to be filed and recorded in the office of the secretary of state, and no railroad corporation shall receive or haul any freight car exceeding fourteen feet in height from the rails to the top of the running board.

SECT. 3. Neglect by any railroad corporation to comply with the orders of the commissioners within a reasonable time to be specified in such orders, shall be punished by a fine of fifty dollars ($50) per day, to be collected by the commissioners in the name and for the use of the state in an action for debt.

CHAPTER 40.—INSPECTION OF FACTORIES AND WORKSHOPS, ETC.

SECTION 1. Any city or town may appoint an inspector of buildings for such city or town, prescribe his duties, and fix his compensation. And any city or town which shall appoint such inspector, may, by ordinance or by by-law, prescribe regulations for the construction and maintenance of all buildings in such city or town which shall be used in whole or in part for mercantile, commercial, manufacturing, or public purposes, or as tenement houses; and all buildings hereafter erected for such purposes in such city or town shall conform to such regulations.

SECT. 2. Any person who shall hereafter intend to erect any building which is intended to be used in whole or in part for mercantile, commercial, manufacturing, or public purposes, or as a tenement house, in any city or town which has appointed a building inspector, shall before erecting such building, submit the plans therefor to such inspector for his examination and approval, under the regulations prescribed by the city or town. And no building intended for such purposes shall be erected in any such city or town without the approval of the plans therefor by such inspector. If any such inspector shall refuse to approve any plans submitted to him, as aforesaid, any person aggrieved thereby, may appeal from the decision of such inspector to the supreme court for the county in which such city or town is situated; and the said court shall make such orders thereon as justice may require.

SECT. 3. Any person violating any of the provisions of this act shall be fined not exceeding one thousand dollars.

CHAPTER 48.—BUREAU OF LABOR.

SECTION 1. The governor, with advice and consent of the council, is hereby authorized to appoint, as soon after the passage as may be,

some competent person to act as commissioner of labor, and he, with such clerks as he may have, shall constitute a bureau of labor, with its principal place of business in the state house, or some other suitable place in the city of Concord.

SECT. 2. The commissioner shall hold his office for the term of three years, and until a successor is appointed and qualified. He may be removed at the pleasure of the governor and council.

SECT. 3. The annual salary of the commissioner shall be fifteen hundred dollars, payable from the state treasury in equal quarterly payments, and the governor is hereby authorized to draw his warrant for the payment of said sum, together with such office and traveling expenses of said bureau as he with the council shall approve.

SECT. 4. In case of the inability of the commissioner to perform his duties, the governor, with advice of the council, may appoint a commissioner for the time being, who shall have the powers and perform the duties of the office while the inability of the commissioner continues. The governor and council shall determine when such appointee shall cease to act as commissioner. Such temporary commissioner so appointed shall be paid, from the state treasury, five dollars a day for the time actually spent in the performance of his duties; and the governor and council shall audit and allow his account.

SECT. 5. The duties of the commmissioner shall be to collect, assort, arrange, and present in annual reports, on or before the first day of January each year, statistical details relating to all departments of labor in the state of New Hampshire, especially in relation to the commercial, industrial, social, educational, and sanitary condition of the laboring classes, and the permanent prosperity of the productive industry of the state.

SECT. 6. Said commissioner shall devote his whole time to the duties of his office, and hold no other office during his term as commissioner.

ACTS OF 1895.

CHAPTER 16.—SEATS FOR FEMALE EMPLOYEES.

SECTION 1. Every person, firm, or corporation employing females in any manufacturing, mechanical, or mercantile establishment in this state, shall provide suitable seats for the use of the females so employed, and shall permit the use of such seats by them, when they are not necessarily engaged in the active duties for which they are employed.

SECT. 2. Any person, firm, or corporation violating any of the provisions of this act shall be punished by a fine of not less than ten dollars, nor more than thirty dollars for each offense.

CHAPTER 42.—TRADE-MARKS OF TRADE UNIONS, ETC.

SECTION 1. Whenever any person, association, or union of workingmen have adopted, or shall hereafter adopt, for their protection, any label, trade-mark, or form of advertisement announcing that goods to which such label, trade-mark, or form of advertisement shall be attached, were manufactured by such person, or by a member or members of such association or union, it shall be unlawful for any person or corporation to counterfeit or imitate such label, trade-mark, or form of advertisement. And whenever any person, firm, association, or corporation is the owner of any literary, dramatic, or musical composition, and the rights of the author pertaining thereto, and such composition has not been copyrighted, printed, or published, or of any map, charter, engraving, cut, print, photograph, or negative thereof, statue, statuary, model, or design, which has not been copyrighted or offered for sale, it shall be unlawful for any other person, firm, association, or corporation to publish, produce, print, or sell, or offer to sell, the same without first obtaining the consent of the owner thereof.

SECT. 2. Every person who shall use any counterfeit or imitation of any label, trade-mark, or form of advertisement of any such person, union, or association, knowing the same to be counterfeit or imitation, shall be guilty of a misdemeanor, and shall be punished as provided in section seven of this act.

SECT. 3. Every such person, association, or union that has heretofore adopted, or shall hereafter adopt, a label, trade-mark, or form of advertisement as aforesaid, may file the same for record in the office of the secretary of state, by leaving two copies, counterparts, or facsimiles thereof with the secretary of state; and the secretary shall deliver to such person, association, or union so filing the same a duly attested certificate of the record of the same, for which he shall receive a fee of one dollar. Such certificate of record shall, in all suits and prosecutions under this act, be *prima facie* proof of the adoption of such label, trade-mark, or form of advertisement, and of the right of said person, association, or union to adopt the same. No label shall be recorded that probably would be mistaken for a label already of record.

SECT. 4. Every such person, association, or union adopting a label, trade-mark, or form of advertisement as aforesaid, may proceed by suit to enjoin the manufacture, use, display, or sale of any such counter-

feits or imitations; and all courts having jurisdiction thereof shall grant injunctions to restrain such manufacture, use, display, or sale, and such person, association, or union shall be entitled to such damages resulting from such wrongful manufacture, use, display, or sale as may be deemed just and reasonable; and the supreme court shall also order that all counterfeits or imitations in the possession or under the control of the defendant in such case be delivered to an officer of the court, or to the complainant, to be destroyed.

SECT. 5. Every person who shall use or display the genuine label, trade-mark, or form of advertisement of any such person, association, or union, in any manner not authorized by such person, association, or union, shall be deemed guilty of a misdemeanor, and shall be punished as provided in section seven of this act. In all cases where such association or union is incorporated, suits under this act may be commenced and prosecuted by any officer or member of such association or union, in behalf of and for the use of such association or union.

SECT. 6. Any person or persons who shall in any way use the name or seal of any such person, association, or union or officer thereof, in and about the sale of goods or otherwise, not being authorized to use the same, shall be guilty of a misdemeanor, punishable as provided in the succeeding section.

SECT. 7. Any violation of any of the provisions of this act shall be punished by imprisonment in the county jail for a term of not less than three months nor more than one year, or by a fine of not less than one hundred dollars, nor more than two hundred dollars, or both.

CHAPTER 107.—COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS.—MANUAL TRAINING.

SECT. 3. Every student taking the two years course, or during two years of any agricultural course, shall devote not less than ten hours a week, during the college year, when practicable, under competent teachers, to practical instruction and manual training in branches of agriculture that require special knowledge and skill, one third of which time may be devoted to suitable practical instruction and manual training in shop-work, in wood, and iron; but any student may be excused from such exercises for physical disability. At the request of parents or guardians, students may be excused from some or all of such exercises by the trustees. A student excused from all, or substantially all, said manual exercises at the request of parent or guardian, and not for sickness or other disability, shall not receive said diploma.

ACTS OF 1897.

Chapter 4.—Relating to Liens of Mechanics and Others.

Section 1. That section 12 of chapter 141 of the Public Statutes be and hereby is amended . . . to read as follows: "Sect. 12. If a person shall, by himself or others, or by teams or machinery, perform labor or furnish supplies to the amount of fifteen dollars or more toward rafting, driving, cutting, hauling, sawing, or drawing wood, bark, lumber, or logs, or toward cooking or hauling supplies in aid of such labor, by virtue of a contract with the owner of the wood, bark, lumber, or logs, he shall have a lien thereon for such labor or supplies."

ITEMS IN THE LABOR WORLD.

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ECONOMIC ASPECT OF THE LIQUOR PROBLEM.

The twelfth annual report of the United States commissioner of labor, just issued, is entitled "The Economic Aspect of the Liquor Problem."

In the report the facts ascertained by the investigation are presented under the following heads: The production of liquors, the consumption of liquors, the traffic in liquors, the experience and practice of employers relative to the use of intoxicants, and laws regulating the revenue derived from liquor production and traffic.

In addition to strictly statistical results of a study of the liquor problem, it was desired to possess some information in regard to the use of intoxicating liquors in its relation to employment, based on the observation and experience of large employers of labor in various industries. It seemed desirable to ascertain from such sources what consideration is given to the drinking habits of the seeker for employment and what means are used in judging the prospective employee generally. To acquire a knowledge of the lines of industry, establishments and occupations in which those indulging in intoxicating liquors are not employed and the reasons for such non-employment seemed important. The extent of the use of liquors by employees subject to night work, overwork, exposure, irregularity of hours of labor such as to work hardship, the shortening of the hours of labor, etc., was deemed to be a subject on which employers should have experience and opinions of value. The relation between pay days, holidays, and Sundays and over-indulgence in intoxicants was suggested in the same connection. And, finally, it seemed of interest to ask what means employers would suggest as in their opinion the best to lessen the consumption of intoxicating liquors.

OPINIONS OF EMPLOYERS.

Employers were asked if in employing new men they were accustomed to give consideration to habits as to the use of intoxicating liquors, and if so what means were used to ascertain such habits. Out of 6,976 employers answering the inquiry 1,613 reported that liquor habits were not taken into consideration, 5,363 reported that means were taken to ascertain the facts.

The two chief single reasons given by employers for the requirement that employees shall not use intoxicating liquors are seen to be "to guard against accidents" and "because of responsibility of position." These two make up more than two thirds of the number reporting, and, in combination with others, comprehend a great many of the remaining cases.

The principal occupations reported as those in which employees are required not to use intoxicating liquors while on duty are:

In agriculture: Foremen, managers, engineers, firemen, cotton ginners, stockmen, sugarhouse employees, clerks, machine hands, cotton planters, and teamsters.

In manufactures: Engineers, firemen, watchmen, foremen, managers, clerks, sawyers, filers, teamsters, machine hands, and packers.

In mining and quarrying: Foremen, engineers, firemen, weighmen, watchmen, machinists, clerks, electricians, handlers of explosives, drivers, and teamsters.

In trade: Engineers, firemen, foremen, watchmen, clerks, salesmen, elevator men, janitors, teamsters, and porters.

In transportation: Trainmen, motormen, conductors, telegraph operators, agents, foremen, electricians, switchmen, and pilots.

FORBID USE OF LIQUOR.

The principal occupations reported as those in which employees are required not to use intoxicating liquors either on or off duty are:

In agriculture: Foremen, managers, engineers, firemen, cotton ginners, sugarhouse employees, clerks, machine hands, and teamsters.

In manufactures: Engineers, firemen, watchmen, foremen, clerks, mechanics, sawyers, filers, salesmen, and machine hands.

In mining and quarrying: Foremen, engineers, firemen, weighmen, watchmen, machinists, clerks, electricians, handlers of explosives, drivers, and teamsters.

In trade: Foremen, clerks, watchmen, and salesmen.

In transportation: Trainmen, motormen, conductors, telegraph operators, agents, foremen, electricians, and switchmen.

The leading occupations of employees reported subject to night work, who are also more addicted to the use of intoxicating liquors than other employees are:

In agriculture: Stockmen, tobacco curers, cotton ginners, engineers, firemen, laborers, dairy hands, sugar plantation men, and watchmen.

In manufactures: Compositors, pressmen, engineers, firemen, sawmill employees, furnace and rolling mill employees, stevedores, tailors, and kilnmen.

In mining and quarrying: Miners, quarrymen, engineers, firemen, laborers, teamsters, and smelters.

In trade: Coal heavers, drivers, and telegraph operators.

In transportation: Trainmen, switchmen, motormen, conductors, drivers, sailors, and stevedores.

The leading occupations of employees reported subject to overwork, who are also more addicted to the use of intoxicating liquors than other employees are:

In agriculture: Stockmen, sheep shearers, cotton ginners, firemen, laborers, harvest hands, and tobacco curers.

In manufactures: Teamsters, loggers, puddlers, molders, engineers, machinists, carpenters, and blacksmiths.

In mining and quarrying: Miners, quarrymen, teamsters, and laborers.

In trade: Bookkeepers, clerks, drivers, and coal shovelers.

In transportation: Trainmen, section men, flagmen, switchmen, drivers, sailors, and stevedores.

DURING SEVERE WEATHER.

The leading occupations of employees reported subject to exposure to severe weather, who are also more addicted to the use of intoxicating liquors than other employees, are:

In agriculture: Field hands, teamsters, and stockmen.

In manufactures: Teamsters, loggers, clay diggers, coal handlers, iron handlers, lumber handlers, and yardmen.

In mining and quarrying: Quarrymen, teamsters, coal handlers, coke handlers, and laborers.

In trade: Drivers, collectors, porters, and laborers.

In transportation: Trainmen, section men, bridgemen, motormen, conductors, drivers, sailors, and stevedores.

Of the total establishments 3,897 stated that their employees were more addicted to the use of intoxicating liquors immediately after pay day than at other times, 2,766 stated that they found no increased indulgence at such times, and 362 failed to answer the inquiry relating to this matter. In the mining and quarrying industry indulgence after pay days is strikingly noticeable. In 924 establishments increased use is reported, against 208 reporting no increase.

In connection with the other inquiries an effort was made to ascertain how many establishments had been troubled with intoxication on the part of their employees, and what if any means had been tried to lessen it. The chief means tried appears to be discharge, reports being received from 1,562 establishments, only 116, however, reporting as to

effectiveness, 112 stating that it was effective, against four not. Change of pay day from Saturday appears as the next leading means tried, 224 establishments reporting having tried it, ninety-two that it was effective and seventeen not effective.

WAGES AND PRICES.

"Comparative Wages and Prices, 1860-1897," is the title of a forty-page report just issued by the Massachusetts bureau of statistics of labor, whose compilations and calculations are carefully made. Comparisons are made between the rates of wages paid in 1872, 1881, and 1897, and in the prices of food products in the years named. As a rule wages were higher in 1897 than in 1881, only eight industries being reported as exceptions, but the wages in 1897 were lower than in 1872, even after the inflated paper rates in 1872 had been reduced to a gold standard. Compared with 1872 there was a decrease of 30 per cent in the price of groceries in 1897, and a decrease of 6.67 per cent compared with 1881. Provisions, as a whole, show a decrease of 18.52 per cent in 1897, compared with both 1872 and 1881. It is plain from the report that the workingmen of 1897 have gained over those of other years mentioned, because their wages have a greater purchasing power. The exact rate of gain is difficult to determine, because so many elements enter into the calculation—the relative number of workers in the different establishments, for example—but there is no doubt that, in a general sense, the working people are in better condition than ever before.

While no other state keeps this class of statistics with the same care as does the Massachusetts bureau, the conditions in that state are much the same as exist in other states. It is gratifying to know of this substantial progress by actual computation, for though one may feel sure that the improvement exists it requires figures to prove it. With wages good, their purchasing power increased and the hours of labor shortened, the workingman has ground for cheerfulness.

CHICAGO LABOR NOTES.

The election of officers and delegates of the Typographical Union resulted as follows: George W. Day, president; William M. Horne, vice president; William McEvoy, secretary-treasurer; George Thompson, secretary-organizer; John Lynch, George T. McNamara, William Schenck, and Joseph Hoban, delegates to the biennial convention of the international union at Syracuse.

One hundred and twenty-five girls in the shoe factory at Larrabee and Superior streets are on strike to force the proprietor to sign an agreement with the union stipulating the price to be paid for stitching. The concern has a contract to furnish 150,000 pairs of shoes for the army.

The striking wood workers of this city are slowly gaining upon the employers. The Wood Workers' Council has issued a statement that twenty-seven wood-working concerns have signed their scale at $2 for a nine-hour day.

The Building Laborers' Union and the Masons and Builders' Association have made an agreement covering working hours, conditions, and wages for the next year. The agreement calls for an eight-hour day, 25 cents per hour, price and one half for overtime, and double price for Sundays and holidays. All grievances are to be submitted to the presidents of both organizations, and in the event of their failure to adjust them they will be referred to an arbitration committee.

THE MOVEMENT IN GENERAL.

The State Labor Congress of New Jersey, which meets in annual convention in Paterson, Aug. 15, judging from the call, will go into politics to a considerable extent. Among the topics for discussion is one to request the political parties at their state conventions to designate their candidate for United States senator, so that the voters, when they vote for state senators and assemblymen, may express their preference for United States senator. Another measure is one condemning the partisan organization of the state labor department and declaring that all members of this board should be in full sympathy with organized labor.

In the differences existing between the operators and miners at Pana, Ill., the state board of arbitration has decided that thirty-three cents gross weight per ton for mine run should be paid, all supplies except powder to be furnished by mine owners, and that the six per cent discount for cashing coupons should be abolished. The decision of the board has been accepted by the miners, while the operators announced that they would not be bound by any decision of the state board whatever.

Rev. Dr. Thompson, secretary of the Presbyterian board of home missions of New York City, has devised a scheme for counteracting the influence of saloons by providing for the working people attractive and safe resorts, especially for the evening. At this resort the Presbyterian church does not intend to dispense any drinks to young men or old, or

to women, that might tend to give them appetites for intoxicants. On the contrary, the aim will be to counteract the drink appetite by pointing out the evil effects of indulgence in intoxicating beverages.

Gahan & Byrne, contractors for section 18 (in the city of Joliet, Ill.) of the drainage canal, commenced work on their big undertaking last Tuesday. Five hundred men were put to work then, and an equally large number will be added shortly.

The United Labor League of Western Pennsylvania has started a movement to induce employers to change the general pay day of all classes of working people from Saturday to Monday, or some other day of the week. The question met with general favor among the delegates present. The chief argument in its favor is that the change will greatly reduce the burdens and hours of clerks and employees of large mercantile establishments, whose hours of labor are extended and duties increased because of the general Saturday pay day.

Judge Holmes of the United States circuit court of Omaha, in deciding a case involving the label of a trade union, recently used the following language in concluding his opinion:

"The label is a part of the well-known machinery of trade unions, and the use of it is found, if a finding be necessary, to be of value to the union and its members. It would not be traveling too far from the record, perhaps, if we should assume that the use of the label is in fact, as certainly it might be, of far more economic importance to the union than are most of the trade-marks, strictly so called, which are protected by the courts."

"When this cruel war is over," says the Rockford, Ill., *Labor Journal*, "we predict that the chasm which has divided capital and labor will have been bridged over to some extent. We should be a united people—North and South, laborer and capitalist."

The masons' laborers of the Laborers' Union Protective Association of New York, 8,000 strong, have just concluded the annual agreement between the union and the Mason Builders' Association for the next year. The wages are fixed at thirty cents per hour, eight hours to constitute a day's work, and no strike can be ordered until the questions in dispute have been considered by a joint arbitration board composed of employers and employees.

The annual report of the Amalgamated Society of Engineers (whose strike for an eight-hour day last year attracted world-wide attention) for 1897, which has just reached this country, shows how far afield those people were who predicted a speedy break-up of this powerful labor union. According to the report the membership during the past year has grown from 87,445 to 91,444, and during the same period the in-

come of the organization was $4,326,255. The amount spent on the great lockout reached the enormous sum of $3,541,995, and this, with $100,000 borrowed during the dispute, leaves a balance of $770,000 in the treasury of the society. The report also states that advances in wages were secured in several districts, and notably along the northeast coast of England, where the Employers' Federation had its headquarters and where they were the most thoroughly organized.

The colored barbers of Nashville, Tenn., are making a fight for the same scale of wages as is paid the white barbers.

The semi-annual report of the United Hatters of North America, just issued, states that there were no strikes in that trade in the past six months. The few differences that arose in this period were quietly settled by arbitration.

A movement has been inaugurated by the wives of trades unionists to organize a consumers' league, one of the objects of which will be to advance the interests of working women and to demand equal pay to women for work equal in value to the same kind of work performed by men.

Prospects seem bright for the settlement of the miners' strike in northern Colorado, as the miners at Marshall went to work last week at the union rate of wages. The situation of the miners' strike at Pana, Ill., is unchanged. Very few non-union men are at work.

The Socialist Trade and Labor Alliance, which was formed in 1895 to fight the American Federation of Labor, is soon to be numbered as one of the "has-beens." Six of the seven members elected as executive officers at the annual convention last month have quit in disgust, because all could not be "the boss of the works."

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